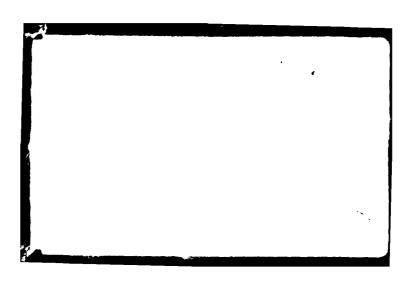


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PROPOSED OPERATIONAL BASE SITE
STEPTOE VALLEY
ELY AREA, NEVADA

Prepared for:

U.S. Department of the Air Force Ballistic Missile Office (BMO) Norton Air Force Base, California 92409

Prepared by:

Fugro National, Inc. 3777 Long Beach Boulevard Long Beach, California 90807

31 March 1980

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered) READ INSTRUCTIONS BEFORE COMPLETING FORM REPORT DOCUMENTATION PAGE I. REPORT NUMBER 2. GOVT ACCESSION NO. 3. RECIPIENT'S CATALOG NUMBER FN-TR-35-3 N77334 5. TYPE OF REPORT & PERIOD COVERED 4. TITLE (and Subtitle) Proposed Operational Base Site, Steptoe Valley, Ely Area, Final Nevada 6. PERFORMING ORG. REPORT NUMBER FN-TR-35-3 7. AUTHOR(s) Fugro Notional, Inc Fo4704-80-C-0006 10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 9. PERFORMING ORGANIZATION NAME AND ADDRESS Entre Western Inc. Germenty Form National PO. BOX 7765 64312 F Thora Beach Ca 90507 11. CONTROLLING OFFICE NAME AND ADDRESS

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TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
2.0	SCOPE	4
3.0	OPERATIONAL BASE - GENERAL DESCRIPTION AND LAYOUT CRITERIA	5
	3.1 Operational Base Structures	5 7 10
4.0	GEOGRAPHIC AND CULTURAL CONDITIONS	11
	4.1 Location	11 12
5.0	GEOTECHNICAL CONDITIONS	14
	5.1 Terrain	14 15 15 16
6.0	GROUND-WATER CONDITIONS	17
	6.1 General Hydrology	17 18 18 18
	6.3 Water Quality Limitations6.4 Impact of Withdrawal	20 [°]
7.0	OPERATIONAL BASE LAYOUT OPTIONS	22
	7.1 Factors Governing the Operational Base Site Selection	22
	7.2 Airspace Considerations	26 28
	Considerations	30 31 33
8.0	CONCLUSIONS	34
METR	IC CONVERSION FACTORS	. 36

TABLE OF CONTENTS (Cont.)

		Page
LIST OF A	BBREVIATIONS	. 37
BIBLIOGRA	РНУ	. 38
	LIST OF TABLES	
Table Number		
6-1	Summary Table of Ground-Water Conditions in Steptoe Valley, Ely Area, Nevada	10
7-1	Mountain Ranges Impacting on Regional Unobstructed Airspace, Steptoe Valley,	• 19
7-2	Ely Area, Nevada	. 27
	Steptoe Valley, Ely Area, Utah	. 32
	LIST OF FIGURES	
Figure Number		
1-1	Proposed Steptoe Valley, Ely Area Operational Base Site, Utah	. 3
3-1	Conceptual Operational Base Layout	
3-2	Unobstructed Airspace - 10,000-Foot Primary Instrument Runway	. 8
7-1	Operational Base Layout - Option 1, Steptoe Valley, Ely Area, Nevada	
7-2	Operational Base Layout - Option 2, Steptoe Valley, Ely Area, Nevada	

FN-TR-35

TABLE OF CONTENTS (Cont.)

LIST OF DRAWINGS

Drawing Number		
4-1	Land Status Map, Steptoe Valley, Ely	
	Area, Nevada	In
5-1	Geotechnical Conditions, Steptoe	Pocket
	Valley, Ely Area, Nevada	At End
7-1	Operational Base Layout - Option 1,	Of
	Steptoe Valley, Ely Area, Utah	Report

1.0 INTRODUCTION

In November 1979, Fugro National, Inc. was tasked to carry out studies supporting the selection of an operational base location or locations. The studies are to include information about water supply, land ownership, existing and proposed transportation systems, terrain, and geotechnical conditions. Using this information, conceptual layouts are to be prepared showing the operational base, designated assembly area, missile assembly buildings, and operational base test site.

The original work statement specified that the following areas should be studied:

- o Pahroc/Pahranagat Valley region;
- o Ely region;
- o Delta region; and
- o Mina region.

Since the preparation of the original work statement, there have been a number of meetings and discussions concerning the location of the operational base. It was recognized that extensive study would be required before a final selection could be made. It was decided, therefore, that it would be beneficial if Fugro National, Inc. could provide as much information as possible about a number of sites, and do so as quickly as possible. As a result of this decision, a preliminary report titled "Initial Operating Base Report" was submitted on 21 December 1979. Eleven possible sites were identified in that report and various conceptual layout options were presented.

In January 1980, Fugro National, Inc. received information from the BMO which stated that Strategic Air Command's (SAC) preference for an operational base was the Coyote Spring and Kane Springs area in Nevada. Based on this information, Fugro National, Inc. began by concentrating its studies on this area. Interim reports on Coyote Spring and Kane Springs valleys and the Milford area of the Escalante Desert, Utah were submitted on 27 February 1980 and 10 March 1980, respectively, under the report designation FN-TR-35.

This third interim report contains data for the operational base site proposed for the Steptoe Valley, Ely area, Nevada (Figure 1-1). It is planned to prepare a fourth report on the Sevier Desert, Delta area, Utah in the latter part of April.

2.0 SCOPE

The potential operational base site in the Steptoe Valley, Ely area, Nevada, was evaluated to determine its geographic, cultural, geotechnical, and geohydrologic conditions. The geographic and cultural conditions were compiled from Bureau of Land Management master title plats and available topographic maps which were either U.S. Geological Survey 7.5- or 15-minute sheets. The geotechnical and geohydrological conditions were evaluated by a review of geologic and hydrologic literature and maps and by interpretation of aerial photographs (1:25,000 scale). A ground reconnaissance of the potential operational base area has not been made.

This study was limited to evaluating the relative suitability of this area as a potential operational base using subjective geotechnical criteria. This study was conducted without benefit of large-scale topographic maps and does not attempt to determine specific road or railroad alignments, structure location or design, and construction cost estimates. Proposed options for operational base layouts are based on best estimates of the actual conditions on site. The airfield orientation was selected without the benefit of actual on-site wind direction data.

3.0 OPERATIONAL BASE - GENERAL DESCRIPTION AND LAYOUT CRITERIA

3.1 OPERATIONAL BASE STRUCTURES

Conceptually, the operational base consists of three main activity centers; 1) the operational base proper, 2) the designated assembly area, and 3) the operational base test site (Figure 3-1). Each of these centers has an estimated size and, in some cases, a specified distance from other centers or structures.

The <u>Operational Base</u> (OB) consists of technical facilities supporting the MX System, housing, attendant support facilities, and a 10,000-foot runway. The area needed for these facilities is estimated to be about 5500 acres or 8.6 mi².

The <u>Designated Assembly Area</u> (DAA) consists of the production Missile Assembly Building (MAB), the maintenance Missile Assembly Building (MAB), and the DAA support facility. The DAA support facility is estimated to occupy 640 acres or 1 mi². It will contain a munitions facility, missile stage storage area, special transport vehicle assembly area, cannister storage, security, and contractor support area. The maintenance MAB and the production MAB each would be approximately 10 acres in area. They would both be situated at least 2965 feet from the nearest structure. The two MABs must be a minimum of 5 statute miles apart, while the DAA as a whole should be no less than 1 statute mile from the OB.

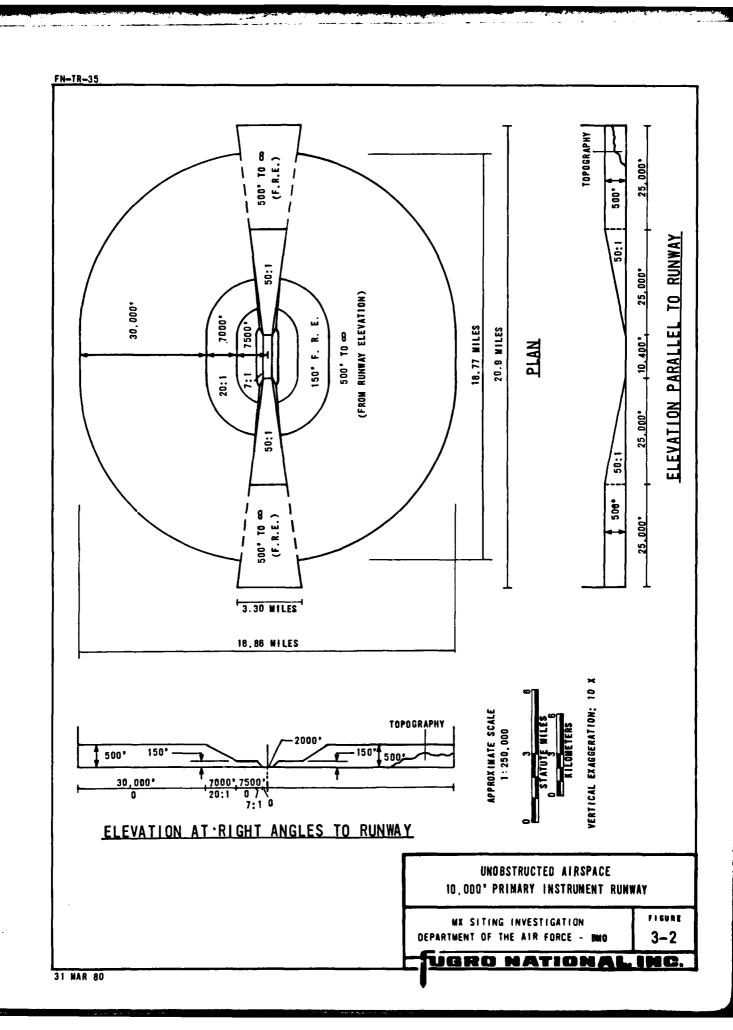
The <u>Operational Base Test Site</u> (OBTS) will consist of a Security Alert Facility (SAF) and a test cluster area. The test cluster area will have 1) a road barrier, 2) a Cluster Maintenance Facility, or CMF (situated at least 2965 feet from the nearest structure), 3) five shelters spaced 3000 to 7000 feet apart, 4) a dash track 1 to 5 miles long with a shelter at the end, and 5) a Remote Surveillance Site (RSS).

3.2 OPERATIONAL BASE AIRFIELD

The primary concerns in selecting an airfield site are the wind direction, the amount of unobstructed air space, and the flying conditions in the area.

The main runway should be oriented parallel to the predominant wind direction. Minor deviations in orientation are possible if there are problems because of terrain conditions or populated areas on the extended runway centerline. A crosswind runway should not be considered unless wind coverage on the primary runway is less than 90 percent, or when the beam wind component on the primary runway is 13 miles per hour during periods of restricted visibility. An extended meteorological study would be needed to determine these factors.

Airspace around an airfield should be free of obstructions to maintain a high level of safety. Criteria for ensuring unobstructed airspace have been developed by the Air Force (AFM 86-8) and the Federal Aviation Administration (FAR Vol XI), as shown in Figure 3-2 and discussed in the following paragraphs.



For both approach and departure, the unobstructed airspace begins 200 feet from the end of the paved runway. It rises at a slope of 50:1 for a horizontal distance of 25,000 feet, at which point it is 500 feet above the runway. This unobstructed airspace continues at 500 feet above the runway for another 25,000 feet. At the same time, the approach/departure corridor widens to 16,000 feet at the ends. The total length of the approach and departure airspace is 20.9 miles.

The airspace on either side of the runway should also be unobstructed. Beginning at the edge of the runway, the unobstructed airspace rises at a slope of 7:1 for a horizontal distance of 1050 feet at which point it is 150 feet above the runway. This elevation is maintained for another 5450 feet outward from the runway. At this point the slope again rises at a ratio of 20:1 so that over the next 7000 feet, an elevation of 500 feet above the runway surface is reached. This 500-foot elevation is maintained for an additional 30,000 feet outward from the runway. This condition must exist completely around the runway except where the approach/departure airspace takes precedence. No object (topographic or manmade) within 44,500 feet of the runway should be higher than 500 feet. The total width of the regional unobstructed airspace is approximately 17 miles.

The existing flying conditions in an area should also be evaluated. The impact on flight corridors, other airfields, and areas of military operation or restricted use should be determined.

The Federal Aviation Administration (FAA) is the responsible federal agency on this subject. All permit applications and follow-on studies (i.e., weather, wind, flight patterns, etc.) must go through the FAA, which in turn releases the results of this review as recommendations. The jurisdiction for permitting, airfield construction, and maintaining unobstructed airspace lies with the local government for each community.

3.3 TRANSPORTATION REQUIREMENTS

An operational base site must have the ability to be connected to a major highway and a major railroad while still being accessible through the Designated Transportation Network (DTN) to the Designated Deployment Area (DDA). The highway and a rail spur will connect the OB with the DAA. Transportation from the DAA to the DDA and the OBTS will be along the DTN.

4.0 GEOGRAPHIC AND CULTURAL CONDITIONS

4.1 LOCATION

Steptoe Valley is an elogated, narrow valley located in central-eastern Nevada (Figure 1-1). It is approximately 150 miles long and generally trends north-south. The valley is in two counties; the northern portion is in Elko County and the southern is in White Pine County. The portion in Elko County is 62 miles long and 26 miles wide at the widest point. The portion in White Pine county is 88 miles long and, for most of that distance, is 10 miles wide. An 8 mile section of the valley, just south of the county line, is 16 miles wide.

The largest communities within Steptoe Valley are Ely-East Ely and McGill. These communities are located in the southernmost sections of the valley and have populations of 5626 and 1629, respectively (White Pine Chamber of Commerce, WPCC, 1980). The city of Ely is incorporated; the suburb of East Ely is not. For purposes of this report, both towns will be considered as one community, called Ely. The only other large community within 20 miles of Ely is Ruth, with a population of 449 (WPCC, 1980).

Ely is the convergence point for highways 6, 50, and 93. Highway 6 enters Ely from the southwest and is the route from Tonapah. Highway 50 comes into Ely from the northwest and is the route from Ruth and Eureka. Highway 93 has a southerly trend and is the route through the White Pine County portion of Steptoe Valley from Wells to Ely. From Ely, these three routes become a single road system which traverses in a southeasterly

direction across Steptoe Valley for a distance of 20 miles to Connors Pass and Spring Valley. No major highway continues northward within the Elko County portion of Steptoe Valley. The Nevada Northern Railroad traverses the length of Steptoe Valley north of Ely.

The Ely study area occupies only a small section of the total Steptoe Valley. The study area is in the southern section of the White Pine County portion of the valley. The area is bounded on the west by the Egan Range in the Humbolt National Forest and on the east by the Schell Creek and Duck Creek ranges, also in the Humboldt National Forest. The southern limit of the study area is Bullwhack Summit, between Steptoe and Cave valleys, and the northern limit is the 39°30' north latitude. From this latitude northward there is only the 1:250,000 scale map series available.

4.2 LAND STATUS

The study area, because of its location around Ely, consists of a higher percentage of private property than the rest of Steptoe Valley. Ranching and mining are the two main land-use activities. A little more than half of the area consists of public lands administered by the Bureau of Land Management (BLM) from their Ely District Office. Much of the public land may contain grazing rights. Within the BLM lands there are a number of applications for withdrawal which could change the present land status. These applications are part of the ongoing Desert Land Entry (DLE) program. The majority of the applications are in a

6.13 mi² area north of the Ely Airport. Another area of applications is a mile southeast of Ely between the railroad and U.S. highways 6, 50, and 93; this area covers approximately 0.63 mi². If the applications are accepted, these areas will become private property.

Another land use in the study area is recreational (i.e., national forest, state park, etc.). The majority of the Humboldt National Forest is on the eastern edge of the valley, and there is some forest land also on the west. There are also two state parks in the area. On the western edge of the southern portion of the valley is the Ward Charcoal Ovens State Park. The State of Nevada has placed an application with the BLM to expand to the north and connect the present park properties. This application is still pending. The other park is the Cave Lake State Park. The park is within the Humboldt National Forest boundary on the eastern edge of the southern portion of the valley. These recreational areas are excluded from further investigation in this study.

5.0 GEOTECHNICAL CONDITIONS

5.1 TERRAIN

Steptoe Valley is a linear valley that extends northward from the southern end of White Pine County for about 100 miles. Steptoe Valley is bounded by the Schell Creek and Duck Creek ranges on the east; the Egan Range forms the western boundary. The crests of these ranges average 3000 to 4000 feet above the valley floor.

The valley can generally be divided into three physiographic areas: the valley lowland, alluvial apron, and mountains. The valley lowland, within the study area, has an average northward gradient of about 22 feet per mile. The lowland ranges in width from less than one-quarter mile in the area south of Ely to greater than 9 miles wide just north of McGill and in the southern portion of the valley.

The alluvial fans are intermediate in slope between the mountains and valley lowland and have gradients that average 300 to 400 feet per mile. Alluvial fans along the eastern margin of the valley are relatively more incised than fans along the western margin. Most of the fans along the eastern margin of the valley, south of Ely, would be excluded from MX shelter deployment based on the incision depth and drainage spacing criteria. Only small areas of adverse terrain exist along the western margin of the valley. Most of the southwesterly portion of Smith Valley (located north of Ely) has adverse terrain conditions (Drawing 5-1).

5.2 FAULTING

A geologic map of Nevada (Stewart and Carlson, 1978) shows a north-south trending fault that cuts the basin fill in the vicinity of Highway 6 in the southeastern portion of the study area (Drawing 5-1). This fault is expressed as a scarp on the aerial photos. No other faults cutting basin fill are shown on the published geologic maps. However, on the aerial photographs, there are several discontinuous north-south trending linear features of possible fault origin along the eastern margin of Steptoe Valley. These photo linears occur in a zone about 3 miles wide.

5.3 FLOODING POTENTIAL

Major flash flooding within the study area would probably be confined to washes that exit some of the larger canyons, such as Mosier and Tamberlain canyons. Sheet flooding is likely to occur on most of the alluvial fan surfaces, especially where there is a lack of well defined drainages, such as the alluvial fans along the eastern side of Steptoe Valley south of McGill.

According to Eakin, Huges, and Moore (1967), flow in most of the streams reaches the valley lowland only during periods of high runoff from snowmelt or from very great precipitation. In March 1966, accumulated snow on the valley lowland melted during a warm spell and resulted in a large volume of water thinly spread over much of the lowland area.

5.4 DEPTH TO GROUND WATER

Eakin and others (1967) indicate that the principal ground-water reservoir is the valley-fill deposits of Steptoe Valley. The top of the zone of saturation or water table is within a few feet of the land surface throughout much of the valley lowland within the study area. The depth to water generally increases toward the mountains beneath the alluvial apron. The water level gradient slopes toward the valley axis from the mountains.

6.0 GROUND-WATER CONDITIONS

6.1 GENERAL HYDROLOGY

Steptoe Valley occupies about 1975 mi² within the Central Hydrographic Region as defined by the Nevada Division of Water Resources (1971). Eakin, Hughes, and Moore (1967) identified the two principal aquifers within the valley as 1) valley-fill deposits, and 2) fractured carbonate rocks of Paleozoic age. The valley-fill deposits consist of interbedded gravel, sand, silt, and clay. The fractured carbonate rocks underlie the valley-fill deposits and crop out in the mountain ranges flanking the valley to the east and west.

The water table within the valley-fill aquifer slopes northward as well as away from the mountains toward the valley axis (Eakin, Hughes, and Moore, 1967). Several areas adjacent to Steptoe and Duck creeks were reported to have depths to water of less than 20 feet. Water-level records compiled by the Soil Conservation Service (Cheney, 1980, personal communication) indicate that there are several perched aquifers with ground-water levels about 20 feet below ground level. Depth to water quickly increases, however, to 60, and even to 100, feet below the land surface basinward from these perched aquifers. Records compiled by the Geological Survey (1978) indicate that ground-water levels in Steptoe Valley declined as much as 20 feet during the period from 1954 to 1964. Since that time, however, ground-water levels have recovered to their 1954 levels.

6.2 WATER AVAILABILITY

6.2.1 Perennial Yield

The perennial yield of Steptoe Valley was estimated to be 70,000 acre-feet by Eakin, Hughes, and Moore (1967). This figure was based on estimated acreages and water consumption of desert shrubs and was also based upon the assumption that all of the water discharged through evapotranspiration is recoverable (Table 6-1).

6.2.2 Present Ground-Water Use

According to estimates by the Nevada Department of Water Resources (Cardinalli, 1979, personal communication), the present ground-water use in Steptoe Valley is approximately 53,000 acrefeet per year. Agriculture is by far the largest user, withdrawing some 33,400 acre-feet per year. Industrial requirements were estimated to be 17,600 acre-feet per year in the State Water Planning Report of 1974 (Nevada Division of Water Resources, 1974). Less than 1000 acre-feet per year were used for domestic and stock purposes, and municipal demands accounted for only about 1200 acre-feet per year. Additionally, applications on behalf of the White Pine Power Project have been filed to use approximately 52,000 acre-feet per year. This action has led to the "designation" of Steptoe Valley as a critical groundwater basin by the State Engineer's Office because the total allocated quantity of water would exceed the estimated perennial yield.

	•		GROUND WAT	ER AVAILABIL	ITY (IN ACRE-FEET YE
PERENNIA L YIELD	PRESENT USE				SOURCE
70.000 ^[2]	53.000 [3]			(1) ALLUVIUM VALLEY FILL AQUIFE (2) FRACTURED CARBONATE ROCKS	
	IRRIGATION	INDUSTRIAL	MUNICIPAL	DOMESTIC AND STOCK	
	33, 400	17,600	1200	1000	

- [1] PERENNIAL YIELD IS THE AMOUNT OF GROUND WATER THAT CAN PS WITHDRAWN PER YEAR FROM A BASIN WITH
- [2] EAKIN, HUGHES, AND MORE (1967). THIS FIGURE ASSUMES THAT ALL WATER DISCHARGED THROUGH EVAPOTI WAS NOT MADE IN THE COYOTE SPRING KANE SPRINGS AND ESCALANTE DESERT OPERATING BASE-REPORTS
- [3] CARDINALLI, 1979, PERSONAL COMMUNICATION
- [4] ASSUMING CONSUMPTION FOR IRRIGATION REMAINS CONSTANT

ACRE-FEET YEAR)		POTENTIAL IMPACTS			
SOURCE	QUD	LITY	GROUND-WATER Levels	WATER QUALITY	S PRING D I S CHARGE
LUVIUM LLEY FILL AQUIFER ACTURED RBONATE CKS	MODERATE TO HIGH TOTAL DISSOLVED SOLIDS, HIGH CaCO ₃ CONSTRUCTION POTABILITY POTENTIAL		MODERATE DECLINE	INCREASED CONCENTRATION OF TOTAL DISSOLVED SOLIDS [4]	POSSIBLE DECREASE
	GOOD TO POOR (HARD)	GOOD			

THROUGH EVAPOTRANSPIRATION IS RECOVERABLE A SIMILAR ASSUMPTION

MASE REPORTS

SUMMARY TABLE OF GROUND-WATER CONDITIONS IN STEPTOE VALLEY. ELY AREA, NEVADA

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE

TABLE 6-1

6.3 WATER QUALITY LIMITATIONS

The water quality is variable depending on the location with respect to recharge areas and depth to the water table. general, the water quality in Steptoe Valley is good, according to analyses reported by Eakin, Hughes, and Moore (1967). 20 samples analyzed, however, two samples exceeded the Environmental Protection Agency (1976) quality criterion for sulfate (250 mg/l) and, accordingly, were classified as poor for drinking purposes. Locally, ground water may be hard, i.e., containing greater than 150 mg/l calcium carbonate. The CaCO3 concentration in ground-water samples from wells ranged between 136 and 281 mg/l, and ground-water samples from springs ranged from 142 to 412 mg/l CaCO3. Only one ground-water sample exceeded the Environmental Protection Agency (1976) criterion of 500 mg/l total dissolved solids for good drinking suitability, although this water is still within some standards for recommended drinking water.

6.4 IMPACT OF WITHDRAWAL

The existing withdrawal of ground water does not exceed the estimated perennial yield in Steptoe Valley. However, proposed development, if pending applications are granted, would exceed the perennial yield. If additional development of ground water for an operating base occurs, then it is likely that water levels would decline. Accordingly, overdevelopment, coupled with a loss of head in the aquifers, could locally reduce some spring discharge.

Depending upon the approach used in obtaining a water supply, the water needed by an operating base could either favorably or adversely affect water quality in Steptoe Valley. If water is obtained through the purchase of existing irrigation water rights and the irrigated land is retired from agriculture, it is likely that the total dissolved solids in the ground water will decline as the leaching action of irrigation water will have been decreased. Conversely, if the amount of water extracted is increased for OB needs and the rate of irrigation remains the same, the total dissolved solids in the ground water would increase at about the same or at a slightly higher rate than before the OB withdrawals.

The designation of Steptoe Valley as a critical ground-water basin largely precludes development of ground water from the shallow aquifer system beyond the estimated perennial yield. There is currently sufficient undeveloped and unappropriated water to fulfill the needs of the operating base unless the State of Nevada approves all or the major part of the White Pine Power Project application. If that application is approved, water for the OB could come from either the purchase of existing water rights, or the possible development of ground water from the deep carbonate aquifer, or a combination of both.

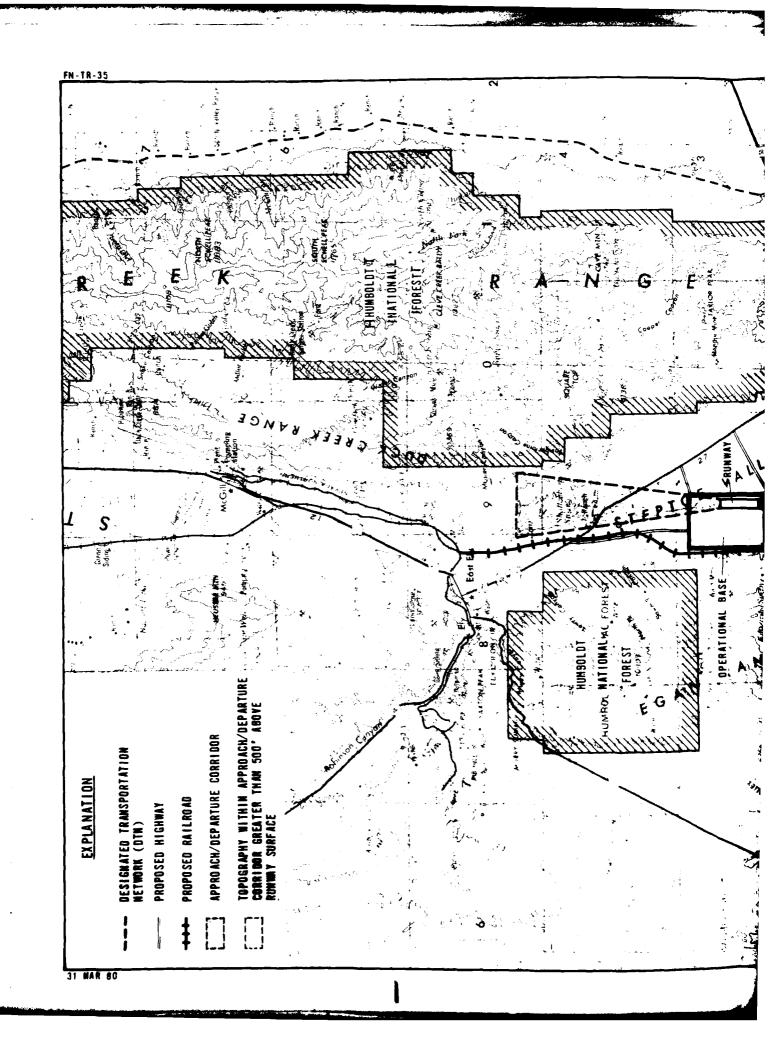
7.0 OPERATIONAL BASE LAYOUT OPTIONS

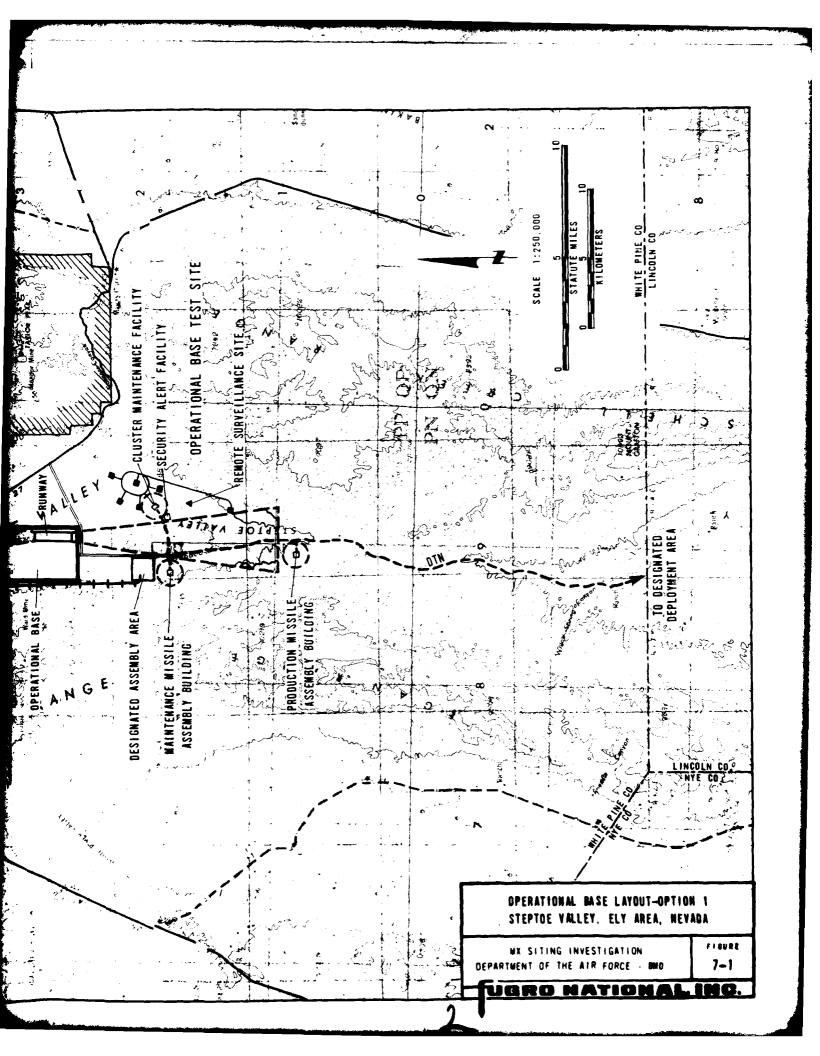
7.1 FACTORS GOVERNING THE OPERATIONAL BASE SITE SELECTION

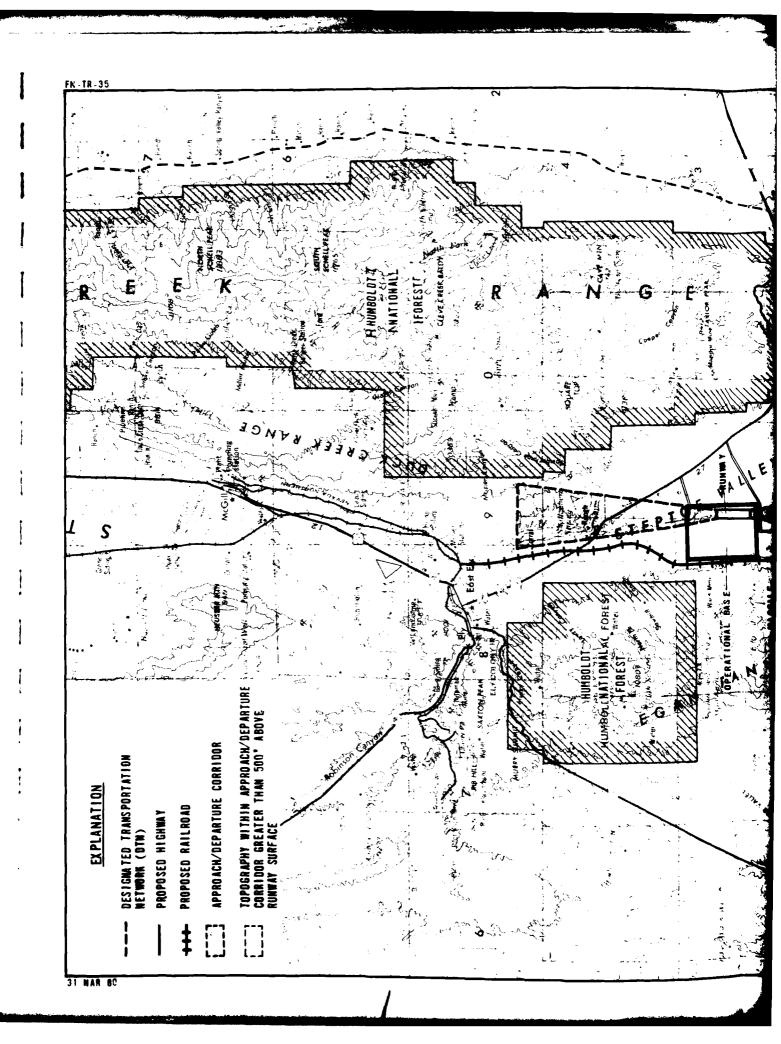
Two possible OB configurations were developed during this study for the Ely area. These configurations (Figures 7-1 and 7-2) are based on the data presented in the previous sections of this report. Because of site conditions discussed below, the location of the OB proper is relatively inflexible. Hence, the same OB location was used for both configurations. The OB location is controlled by 1) the unobstructed approach and departure airspace needed for the airfield, and 2) the availability of a 5500-acre parcel (preferably on BLM land).

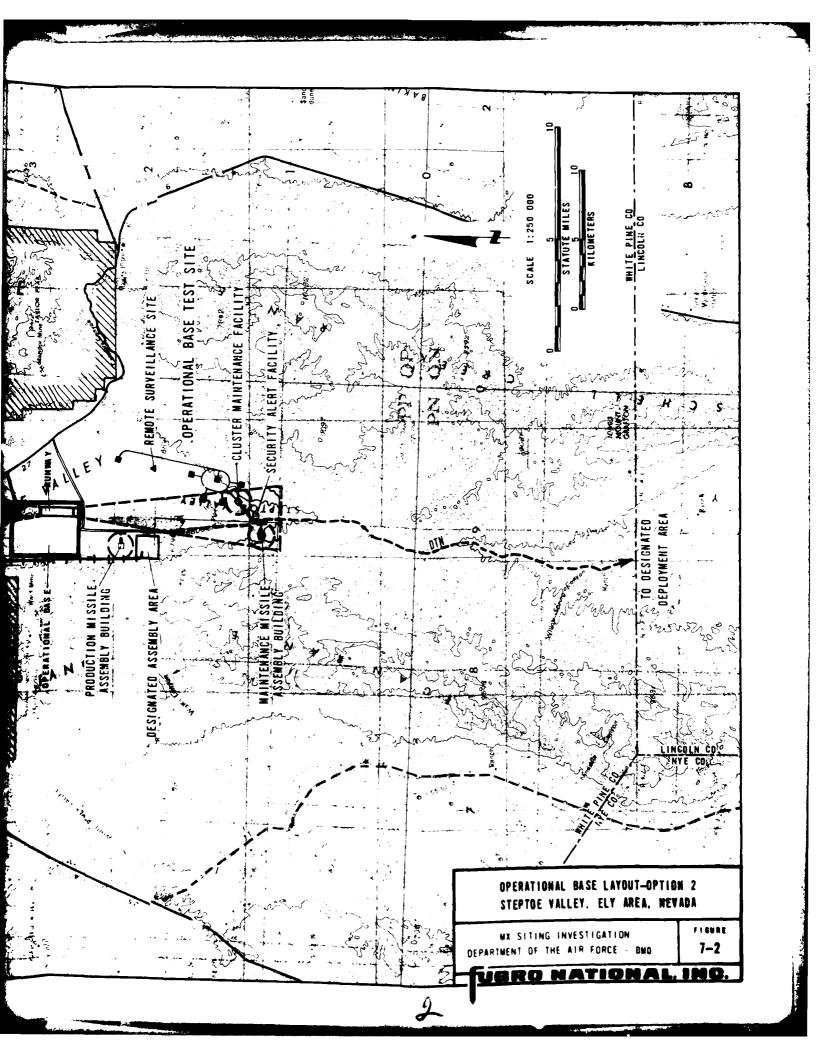
There is no area 17 miles by 20.9 miles of wholly unobstructed airspace in the study area. However, there is a zone in the central portion of the valley where the approach/departure criteria are met. The zone covers the full length of the study area and assumes that the prevailing wind is also north-south following the length of the valley.

Within the zone of acceptable approach and departure space, there are three areas of contiguous BLM land. One area is at the northern end of the study area, 2 miles north of McGill. A second area is just north of Yelland Field (Ely's airport). The other area is 11 miles south of Ely in the southernmost section of the study area. The southern location appears to be the best for an operational base.









The central area, just north of Yelland Field, does not seem to have enough contiguous BLM land to contain the OB layout. Additionally, this is the 6.3 mi² area under the Desert Land Entry application mentioned in Section 4.2. As a further limitation due to the close proximity of Yelland Field, airspace problems could develop if the OB in this area is to have its own airfield. The OB could use Yelland Field provided that the airfield is expanded. An expanded airfield would also have problems since the southern approach/departure corridor is partially obstructed by Egan Range.

If the contiguous BLM land north of McGill is selected as an OB site, its airfield approach/departure corridor would overlap with the activities at Yelland Field. Additionally, this area would be under the plume from the McGill smelter. This cloud could reduce visibility for aircraft attempting to use the OB airfield. The distance from this OB location to the closest DDA presently under study would be 15 to 25 miles greater than from the possible OB location south of Ely.

The contiguous BLM land south of Ely is of sufficient area to contain the OB layout. There is private property in the area, but it can be avoided. Also, there is generally sufficient area for the approach/departure corridor; some infringements on the corridor airspace occur as a result of shifting the airfield to the south and east to avoid an area of potentially shallow ground water. The OB proper is in the western portion of the available BLM land. This location was selected to avoid the

The second

area of potentially shallow ground water and the zone of potentially active faults to the east.

7.2 AIRSPACE CONSIDERATIONS

The airfield location shown on Figures 7-1 and 7-2 and Drawing 7-1 has been selected based on the airspace criteria presented in Section 3.2 and on the possible operational base locations discussed above.

A portion of the topography within the unobstructed approach and departure airspace for this airfield does not meet the criterion of being less than 500 feet above the runway surface. In the southern approach/departure corridor, there is obstructed airspace in both the southeastern and southwestern corners. In the southwestern corner, the Egan Range protrudes 48 feet into the unobstructed airspace. In the southeastern corner, Schell Creek Range violates the unobstructed airspace by 80 feet. Because of these ranges, the unobstructed approach/departure airspace is 2.2 miles wide, rather than the 3.3 miles preferred in the criteria.

The topography at right angles to the airfield generally does not meet the criteria for regional unobstructed airspace. Within the areas tht should be unobstructed, there are the Egan Range, Duck Creek Range, and Schell Creek Range. The extent to which each of these ranges deviates from the regional unobstructed airspace criteria is presented in Table 7-1.

Airspace usage in the study area seems to be unrestricted. The Gandy Military Operation Area (MOA) is 28 miles to the northeast

MOUNTAIN RANGE	EGAN RANGE	DUCK CREEK Range	SCHELL CREEK RANGE
MAXIMUM ELEVATIONS WITHIN REGIONAL UNOBSTRUCTED AIRSPACE	7160 TO	7192 TO	7206 TO
	10,936 FEET	7440 FEET	9412 FEET
HEIGHT OF RANGE IN EXCESS OF UNOBSTRUCTED AIRSPACE CRITERIA	3816 FEET	320 FEET	2292 FEET
CLOSEST PEAK TO RUNWAY HEIGHT IN EXCESS OF UNOBSTRUCTED AIRSPACE CRITERIA AND PROXIMITY TO RUNWAY	40 FEET	72 FEET	86 FEET
	2.25 MILES	7.5 MILES	6.5 MILES

NOTE: (1) RUNWAY ELEVATION IS AS FOLLOWS:
OPTIONS 1 AND 2 6620 FEET

MOUNTAIN RANGES IMPACTING ON REGIONAL UNOBSTRUCTED AIRSPACE STEPTOE VALLEY, ELY AREA, NEVADA

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - BMO

7ABL E 7-1

UGRO NATIONAL INC.

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and should not affect the airspace. The same is true for the Sevier "A" MOA which is 42 miles to the east. The only local airfield is Yelland Field, north of Ely, which should not pose a problem although conflicts may develop if the runway is extended.

7.3 TRANSPORTATION CONSIDERATIONS

With the possible operational base locations selected, the problems of providing ground transportation to the site need to be considered. U.S. highways 6, 50, and 93 is near the OB location and can be accessed by short roads from the OB. Additionally, the Nevada Northern Railroad traverses the length of the valley as far south as Ely.

The Nevada Northern Railroad was constructed in about 1906 with 60 and 70 pounds-per-yard rail which is still in use (Munson, 1979, personal communication). The railroad is a wholly owned subsidiary of the Kennecott Copper Company and connects with the Southern Pacific Railroad at Cobre and the Western Pacific Railroad at Shafter. The distance between Cobre and Shafter is 19.5 miles; between Shafter (Elko County) and Ely, the distance is 120.6 miles. Present service is limited to twice weekly runs, with the main traffic being in-bound copper ore to the smelter at McGill. Maximum operating speed on the line is 25 miles per hour. There are no bridge structures on the line, all drainage crossings being handled by culverts. Presently four locomotives operate on the line.

On the existing line, the maximum allowable load is 220,000 pounds gross per standard car. It will be necessary to upgrade the line to heavier rail to handle the anticipated MX loads. It has been estimated by Nevada Northern Railroad that the cost to upgrade the line to 136 pounds per-yard rail and fastenings would be about \$60.00 per foot. It is probable that 119 poundsper-yard rail would be sufficient, but the savings in cost would be minor in the overall picture. Based on \$60.00 per foot for a minimum distance of 120.6 miles, the estimated cost of upgrade would be over \$38 million. A cost for upgrading all existing rail in the Nevada Northern system is over \$46 million.

There are presently two possibilities which may result in the railroad being upgraded to heavier rail. One is a proposed coal-fired power plant to be constructed in White Pine County. The plans for this plant are presently in the environmental impact study stage, and it will probably be three or four years before construction begins. The exact site for the proposed plant has not been selected, but the railroad main line will need to be upgraded to handle the coal unit trains.

The second possibility which may result in upgrading of the rail line has to do with a bond issue authorization recently passed by the State Legislature whereby White Pine County can issue improvement bonds. It is thought that Nevada Northern may be able to come under the scope of these improvement bonds. If Ely is determined to be an optimum OB site, the Air Force may be

looked upon by Nevada Northern as a third possibility for funds to upgrade their rail.

The preferred OB location south of Ely is 13 miles south of the nearest section of the Nevada Northern railline. The proposed additional alignment, from the north (Drawing 7-1), crosses a mile of private property and U.S. highways 6, 50, and 93. South of the highway, the alignment must contend with small drainages and some adverse terrain. Generally, the route should not present any extreme construction difficulties.

7.4 DESIGNATED TRANSPORTATION NETWORK CONSIDERATIONS

The Designated Transportation Network (DTN), as presented in Options 1 and 2 (Figures 7-1 and 7-2, Drawing 7-1), connects the production MAB in Steptoe Valley with the closest Designated Deployment Area (DDA) in Cave Valley. The route is 17.5 and 25 miles in length for Options 1 and 2, respectively. There is a four percent maximum estimated grade through Bullwhack Summit at an elevation of 7240 feet ASL (Railroad Pass Evaluation, FN-TR-RP, 16 November 1979). The overall evaluation of the summit was that it was 'Easy'; that is, it seemed to have minor alignment, grade and drainage problems, light to moderate grading needs, and a standard time for construction.

From Cave Valley, the remainder of the DDA can be reached by construction of the DTN to the east and south into Muleshoe Valley or to the west into White River Valley. This approach is maximized by the location of the production MAB in Option 1. Option 2 places the production MAB further north and closer to

the existing U.S. Highways 6, 50, and 93. If the DTN were to use this existing highway, the nearest DDA would be 32 miles to the east in Spring Valley and 52 miles to the west in White River Valley. U.S. Highways 50 and 93 must traverse Connors Pass (7720 feet ASL) to the east. U.S. Highway 6 uses Murray Summit (7320 feet ASL) into the western valleys. If valleys to the north are included into the DDA, U.S. Highway 50 to the northwest could be used. This route passes through Robinson Summit (7540 feet ASL) into Jakes Valley (a distance of 47 miles). Each of the passes will need to be evaluated for use as part of the DTN. A combination of newly constructed DTN and existing highways as the optimum approach to DDA access should be evaluated.

7.5 OPERATIONAL BASE LAYOUT - OPTION 1

The OB configuration Option 1 is shown in Figure 7-1 and Drawing The OB proper has been located as discussed in Section 7-1. The DAA is 3 miles south of the OB (Table 7-2) along Cave Valley Road, a gravel road which will need to be realigned and upgraded. The production MAB is 5.5 miles south of the maintenance MAB along Cave Valley Road. These components are situated in the western half of the valley to avoid the possible shallow groundwater table to the north and the potentially active faults in the east. The Security Alert Facility (SAF) and the Cluster Maintenance Facility (CMF) are 2.5 miles east of the maintenance The Operational Base Test Site (OBTS) trends north-south MAB. along the eastern edge of the valley south of U.S. Highways 6, 50, and 93. This location was selected because it offers the

Option (1)	RA I LROAD		H I GHWA Y		DESIGNA	
	From Nevada	From Nevada Northern to OB (2) From OB to DAA to OB	From Flv	From OB	From DAA	
			to OB		to Maintenance MAB	to Production
	-					
1	13(3)	7	11	3	.56 ⁽⁴⁾	7
2	13	7	11	3	6	56

NOTES:

- (1) See Text and Figures 7-1, 7-2
- (2) See Figure 3-1 for Abbreviations
- (3) Distances given are in Statute Miles
- (4) 56 Mile Represents the 2965-Foot Stand off Distance in Miles

DESIGNATED TRANSPORTATION NETWORK				DTN./HIGHWAY		Straight Line	
Production MB	From Maintenance MAB to OBTS	From Production MAB to DDA	From OBTS to DDA	From OBTS to OB	From OB to DAA	From Maintenance MAB to Production MAB	
1	3	17.5	24.5	6	27	5.5	
. 56	1 12	25	19	9	27	6.5	

DISTANCES BETWEEN OPERATIONAL BASE COMPONENTS STEPTOE VALLEY, ELY AREA, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

7-2

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most isolated position. Also, the OBTS would be the least impacted of the components by the nearness of possibly active faults. This layout configuration minimizes the distances between the DAA, maintenance MAB, and the OBTS, while not locating any component within the airfield approach/departure corridor.

7.6 OPERATIONAL BASE LAYOUT - OPTION 2

Option 2 (Figure 7-2) is based on the same location for the OB, DAA, and DTN (to the DDA) as Option 1. The general area of the OBTS is the same, but the CMF has been relocated from the northern end to the southern. The production MAB was moved to just north of the DAA and the maintenance MAB was placed in the original production MAB location. The distance between the two MABs is 6.5 miles. The CMF and the maintenance MAB remain in close proximity to each other. The production MAB becomes more accessible to the existing highways if they are used for the DTN, while still maintaining access to the DTN as presented. Both the maintenance MAB and the CMF are within the southern portion of the airfield approach/departure corridor.

8.0 CONCLUSIONS

Based on the preceding discussions, it is possible to reach the following preliminary conclusions regarding the suitability of the Ely area for an operational base site:

- o In general, the Ely area has sufficient area for the layout of the OB and its components, however, this area is limited by land use, geotechnical, and airfield considerations to options in the southern portion of the valley. These options are entirely on BLM land.
- o There are some areas of adverse terrain, flooding potential, and shallow ground water within the study area but these can be avoided or mitigated. Additionally, there are potentially active faults in the southeastern portion of the study area. It is expected that potential problems associated with faults can be mitigated by proper placement of critical structures and by using appropriate seismic design.
- o Steptoe Valley has been designated by the Nevada State Engineers Office as a critical ground-water basin. Ground water in the valley is generally of suitable quality for use during construction and operation. The quantity of available water needs further evaluation. The withdrawal of ground water will need to be carefully planned and the possible further lowering of the water table investigated.
- o It is not possible to site an OB airfield which fully complies with the guidelines for regional unobstructed airspace.
- o Although there is sufficient area for the total OB layout, the location of the OB proper is restrained by: 1) the airfield criteria regarding the approach/ departure corridor, and 2) avoidance of the area of poor terrain and possible shallow ground water.
- o Although the location of the OB proper is relatively inflexible, there are multiple locations available for the other activity centers. Two possible configurations have been presented here; final configurations can only be developed after all trade-offs have been considered.
- o The Ely area offers good access, either by a constructed DTN through Cave Valley or existing highways into the other valleys of the DDA. The Nevada Northern Railroad will have to be upgraded. The transportation, both rail and highway, and local community impacts should be considered before final site selection is made.

o Options 1 and 2 are located in a portion of the study area that appears to be suitable for inclusions in the DDA. The location of an OB in this area could cause the loss of about two cluster sites within the total DDA.

Should Steptoe Valley be selected for the OB, it is recommended that ground-water observation wells be drilled to obtain better information about ground-water conditions. This information should be available before final site selection is made to avoid construction where the ground water is near the surface.

METRIC CONVERSION FACTORS

Because of the large number of distance figures presented in this report, it was felt that presentation of metric equivalents within the text would result in cumbersome reading. Therefore, the metric conversions are presented below for convenience.

1 foot = 0.3048 meters

= 1.6093 kilometers 1 mile

l acre = 0.4047 hectares

 $1 \text{ mile}^2 = 259 \text{ hectares or } 2.59 \text{ km}^2$

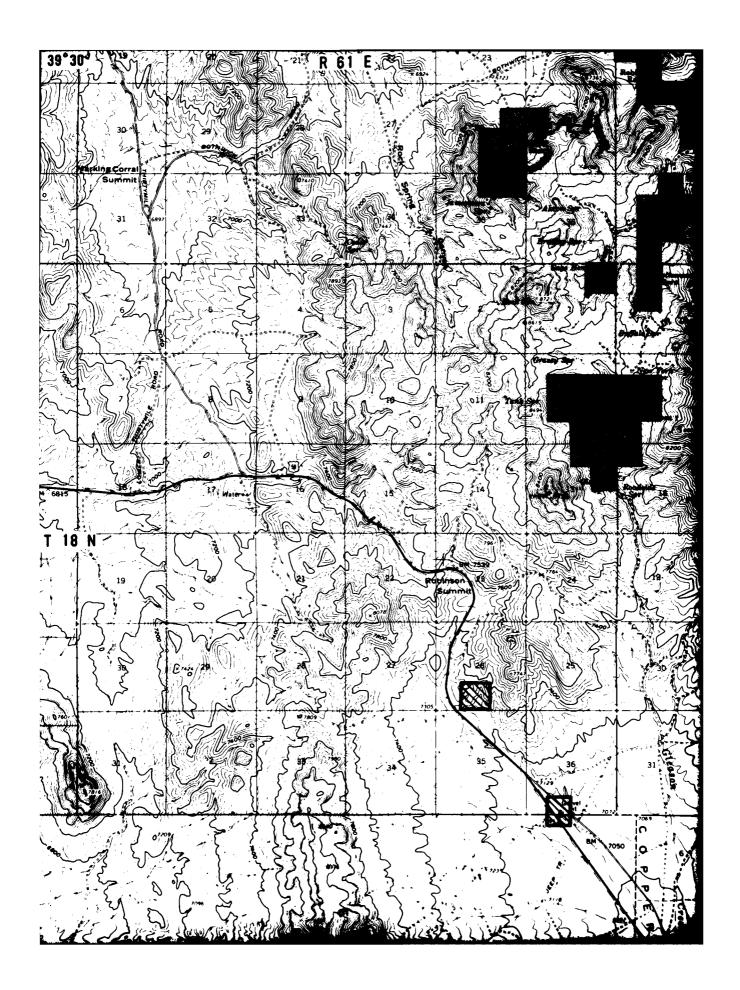
1 acre foot = 1233 meters^3

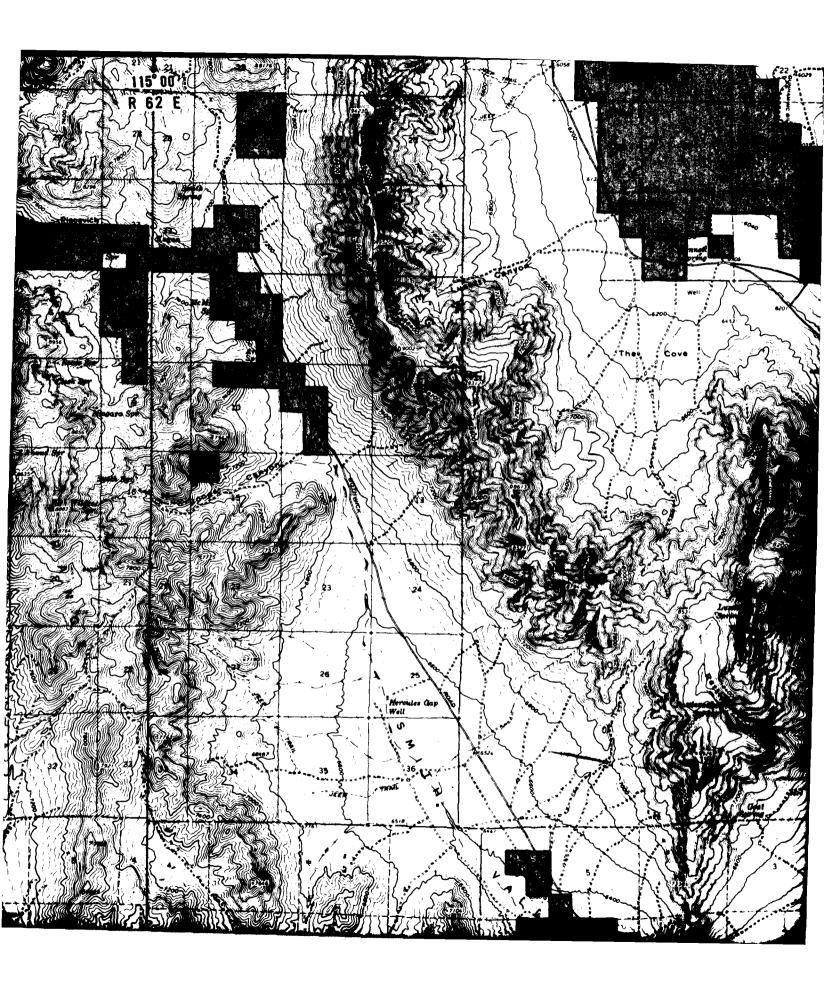
LIST OF ABBREVIATIONS

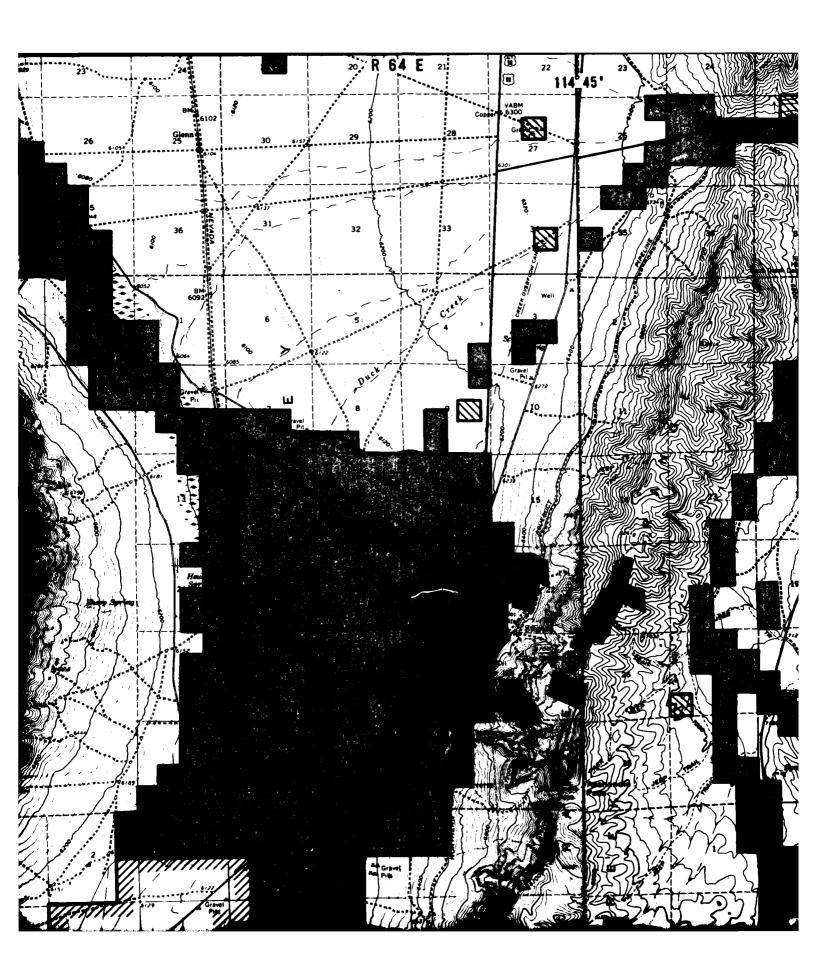
AFM	Air Force Manual
ASL	Above Sea Level
BLM	Bureau of Land Management
вмо	Ballistics Missile Office
CMF	Cluster Maintenance Facility
DAA	Designated Assembly Area
DDA	Designated Deployment Area
DLE	Desert Land Entry
DTN	Designated Transportation Network
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
MAB	Missile Assembly Building
MOA	Military Operation Area
ОВ	Operational Base
OBTS	Operational Base Test Site
RSS	Remote Surveillance Site
SAF	Security Alert Facility
WPCC	White Pine Chamber of Commerce
WPPP	White Pine Power Project

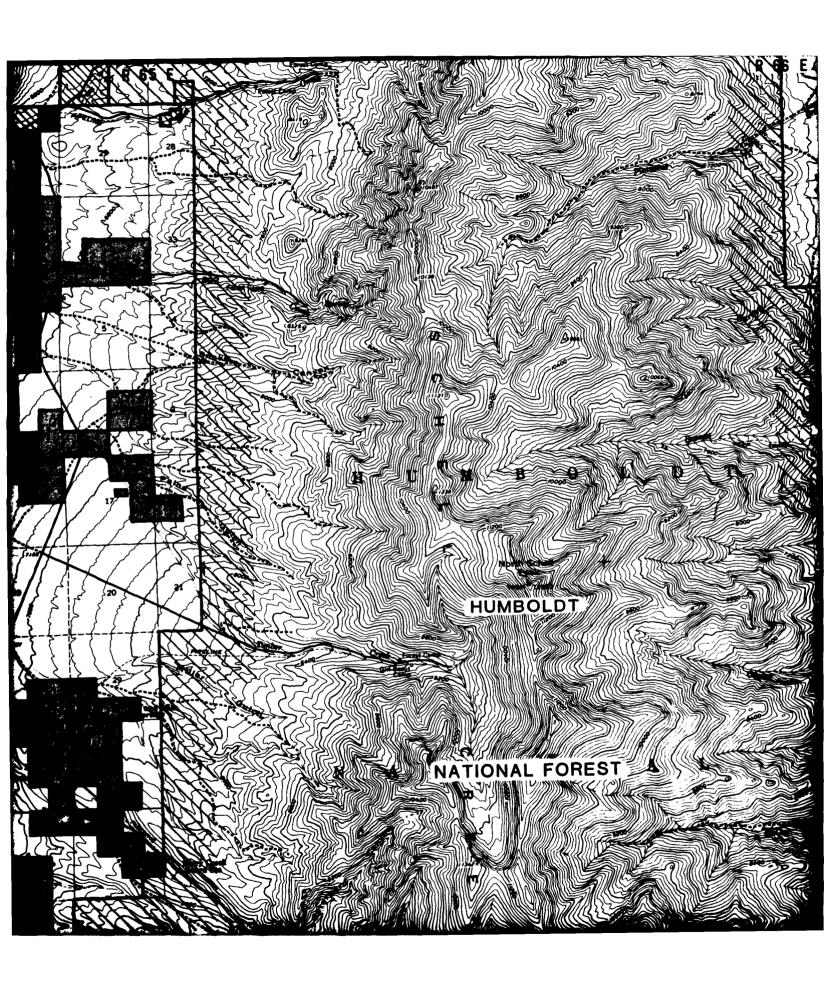
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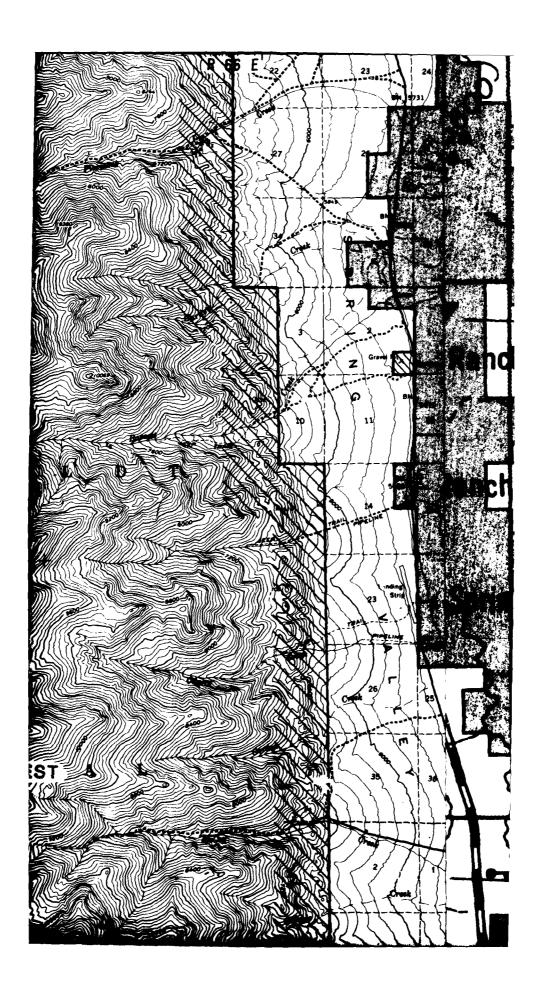
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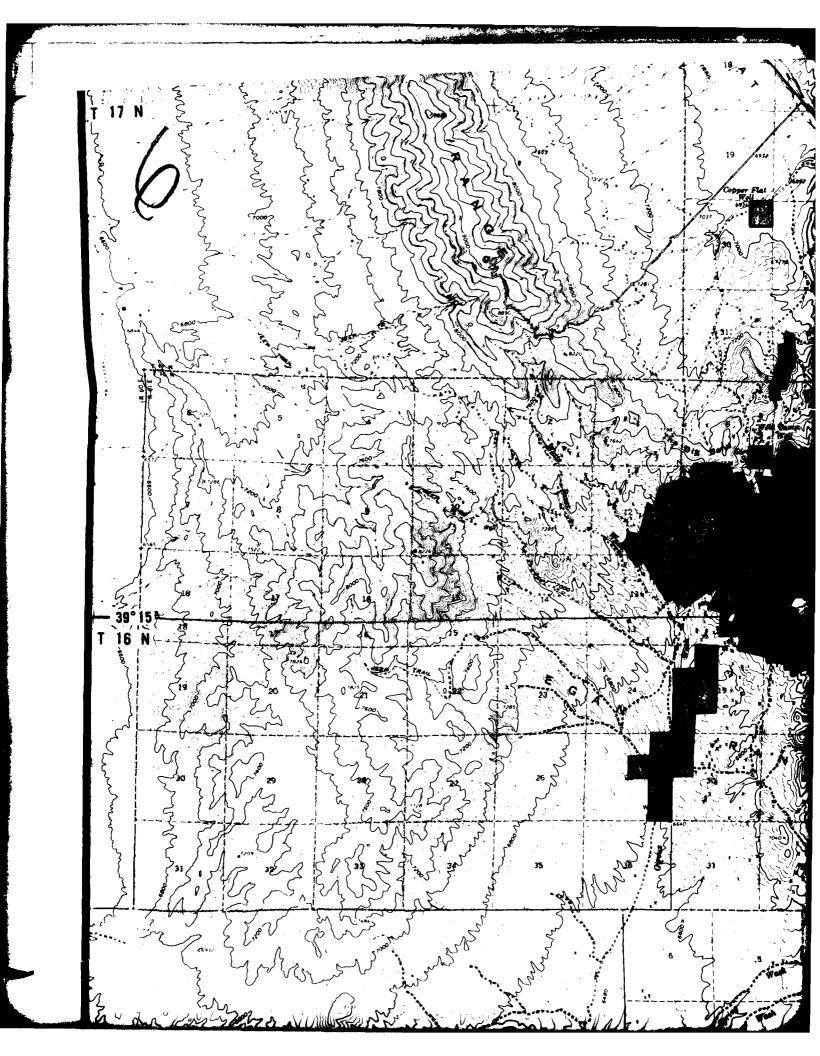


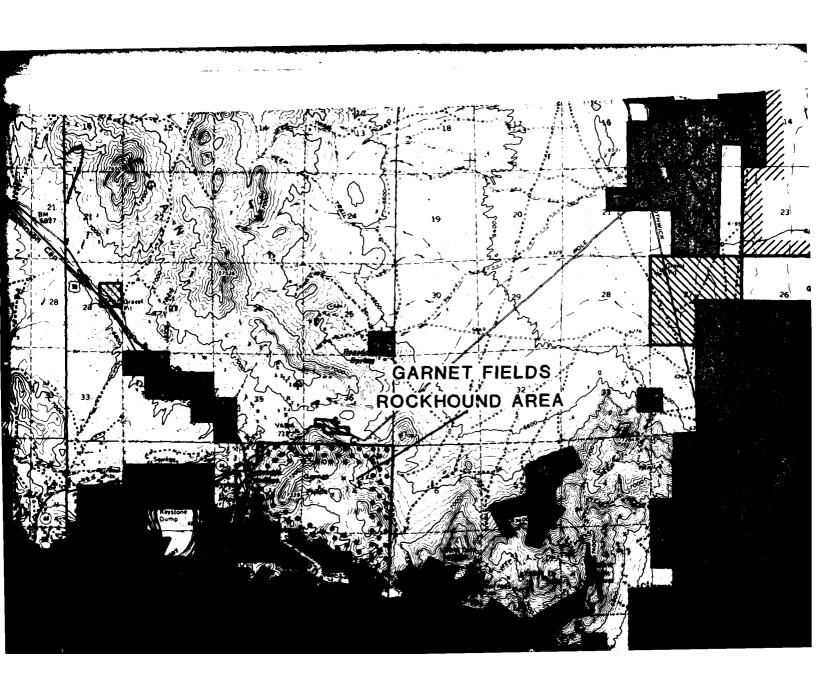


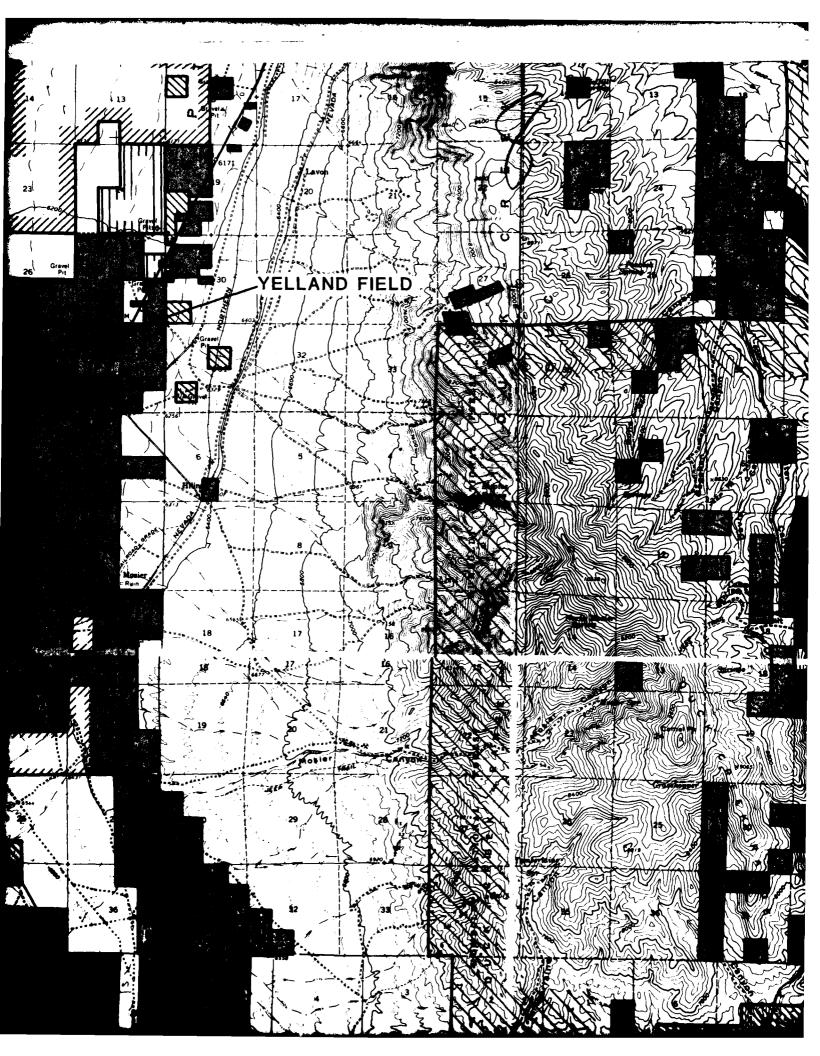


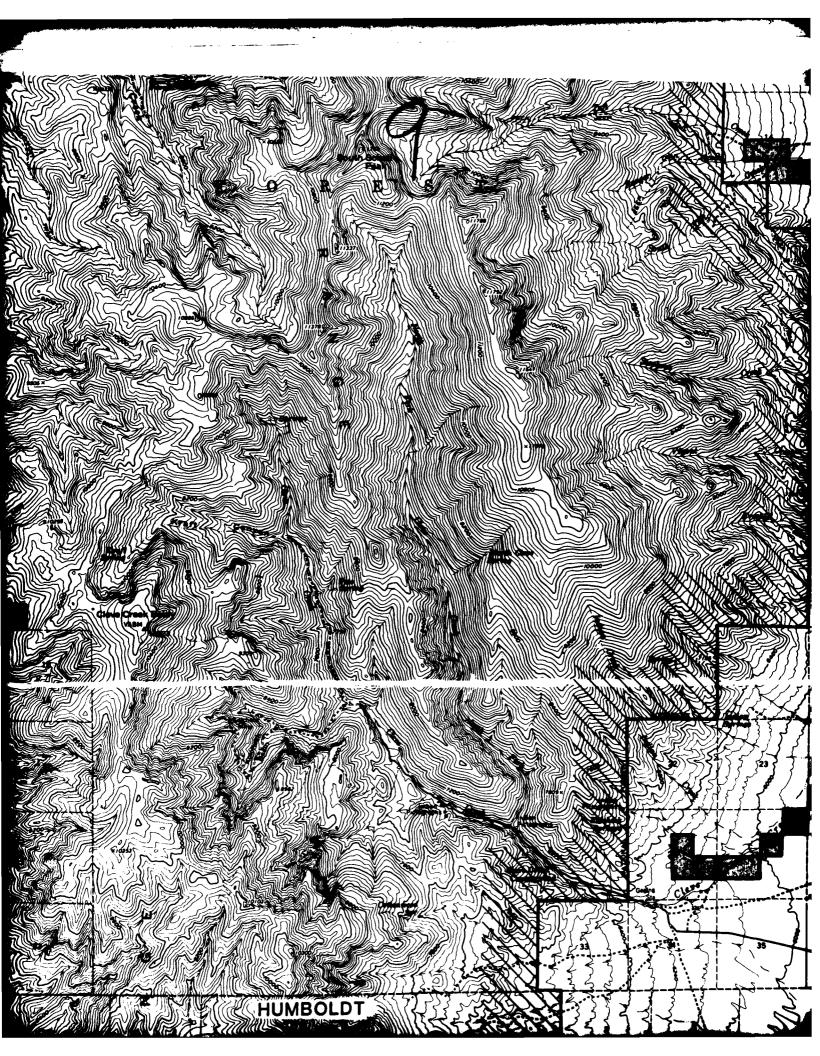


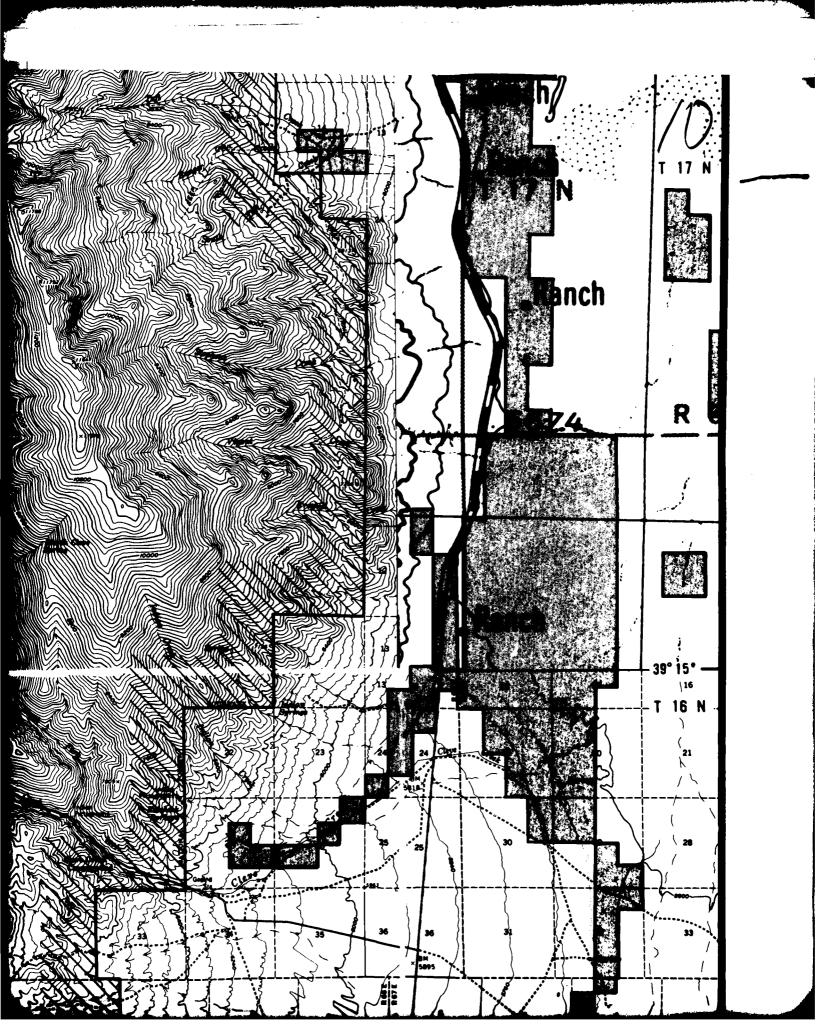


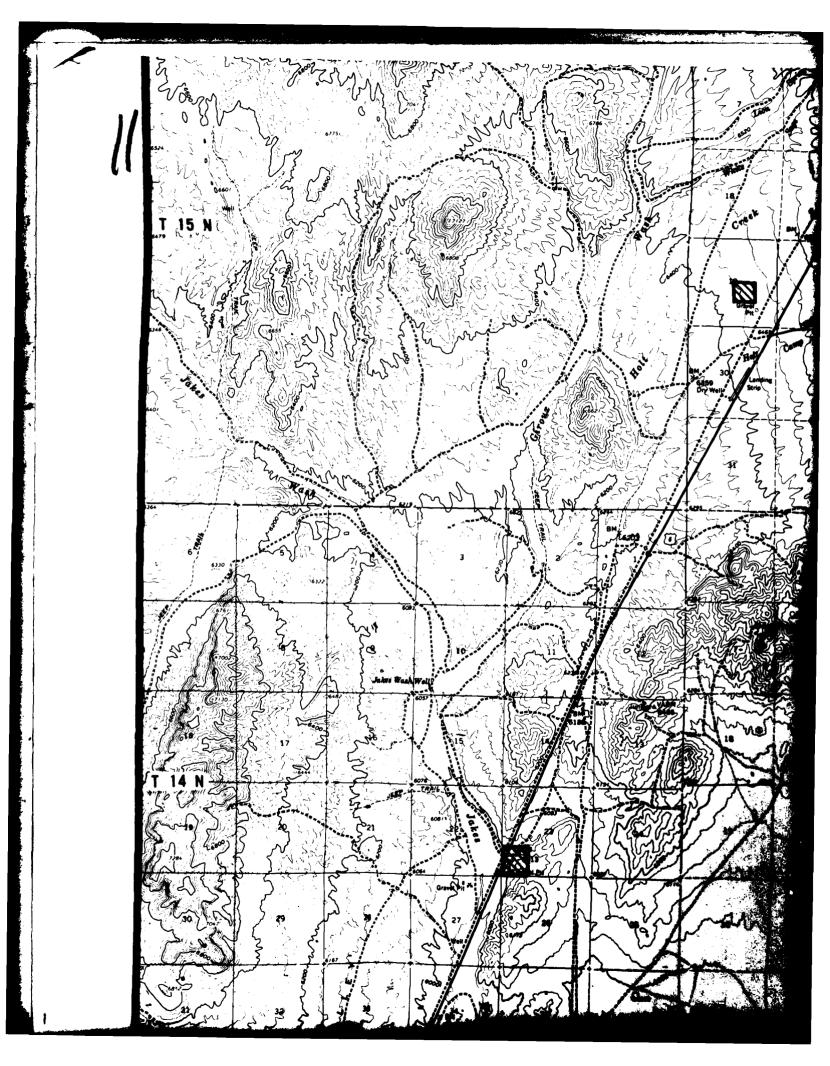


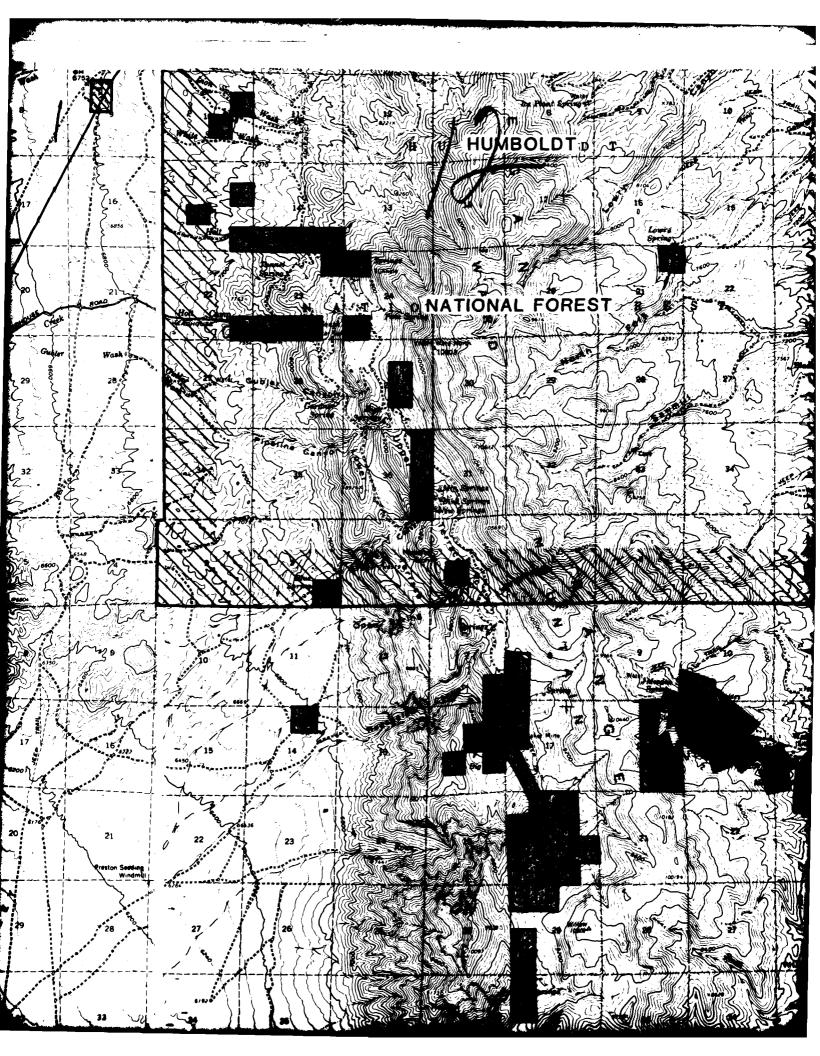


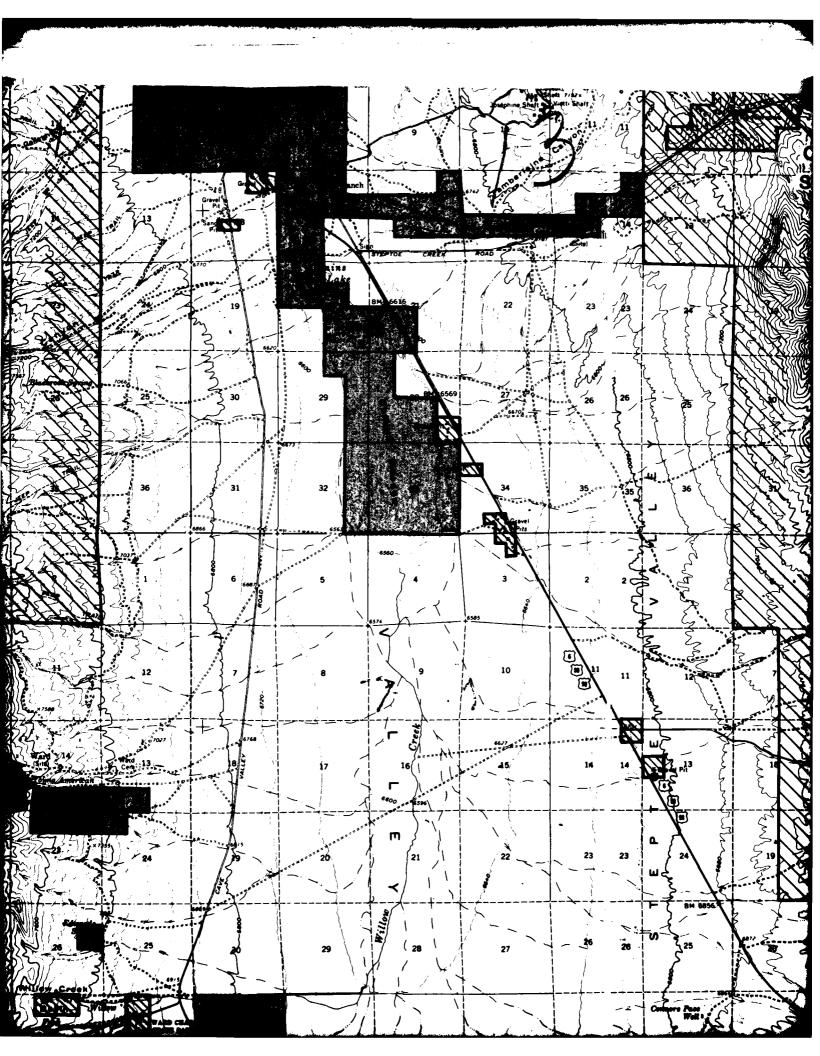


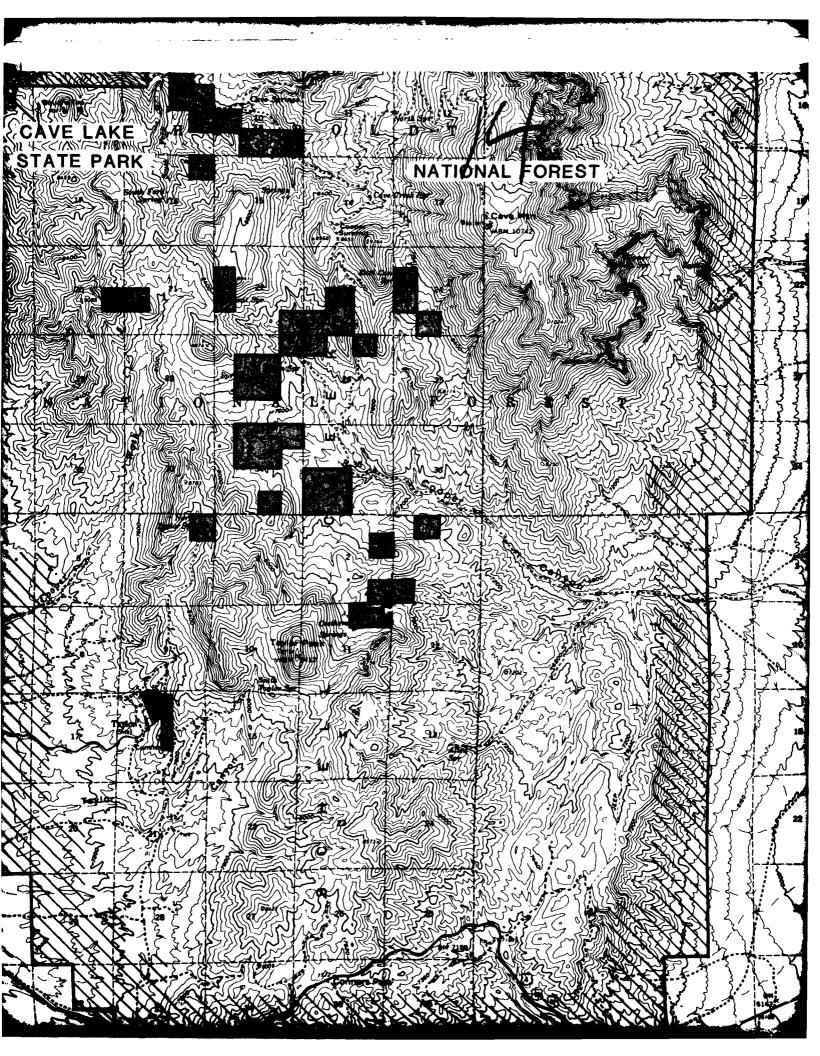


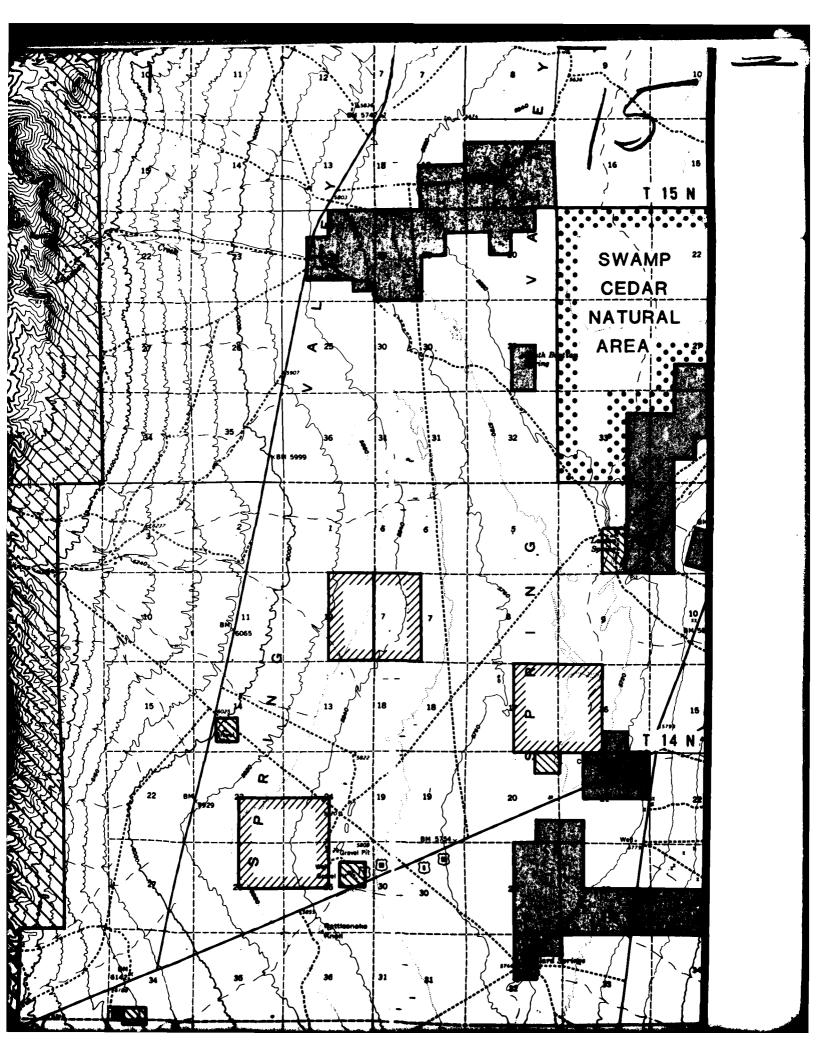


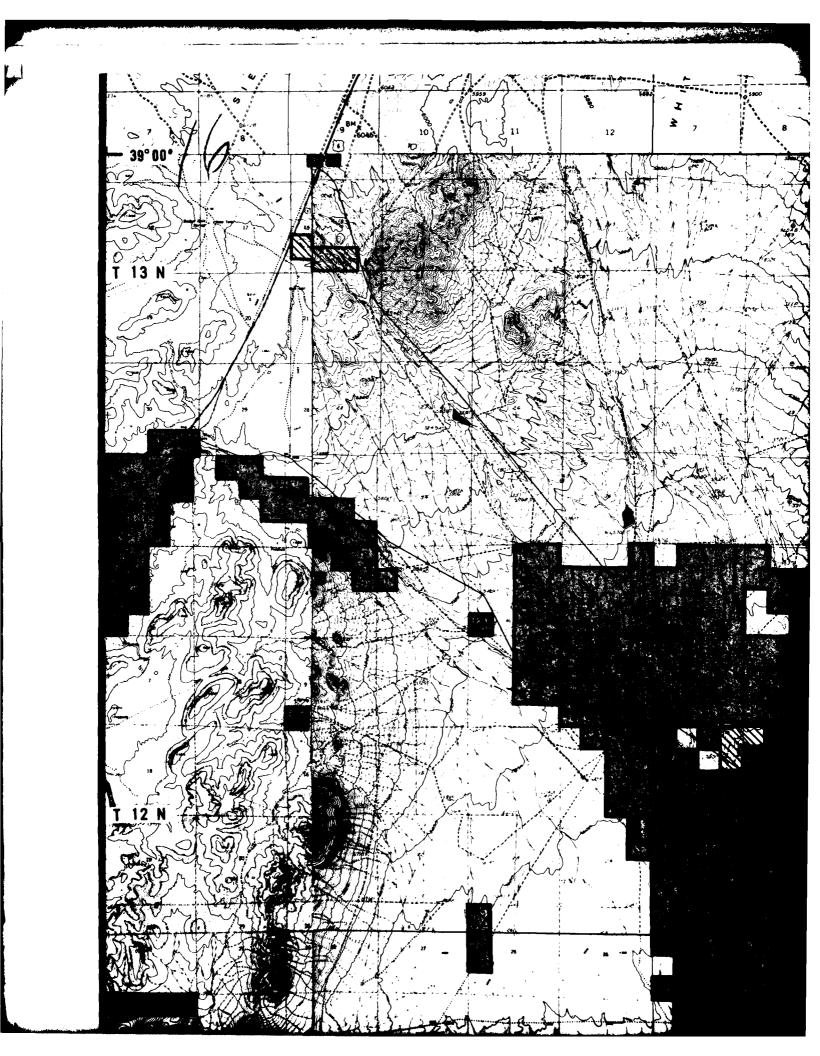


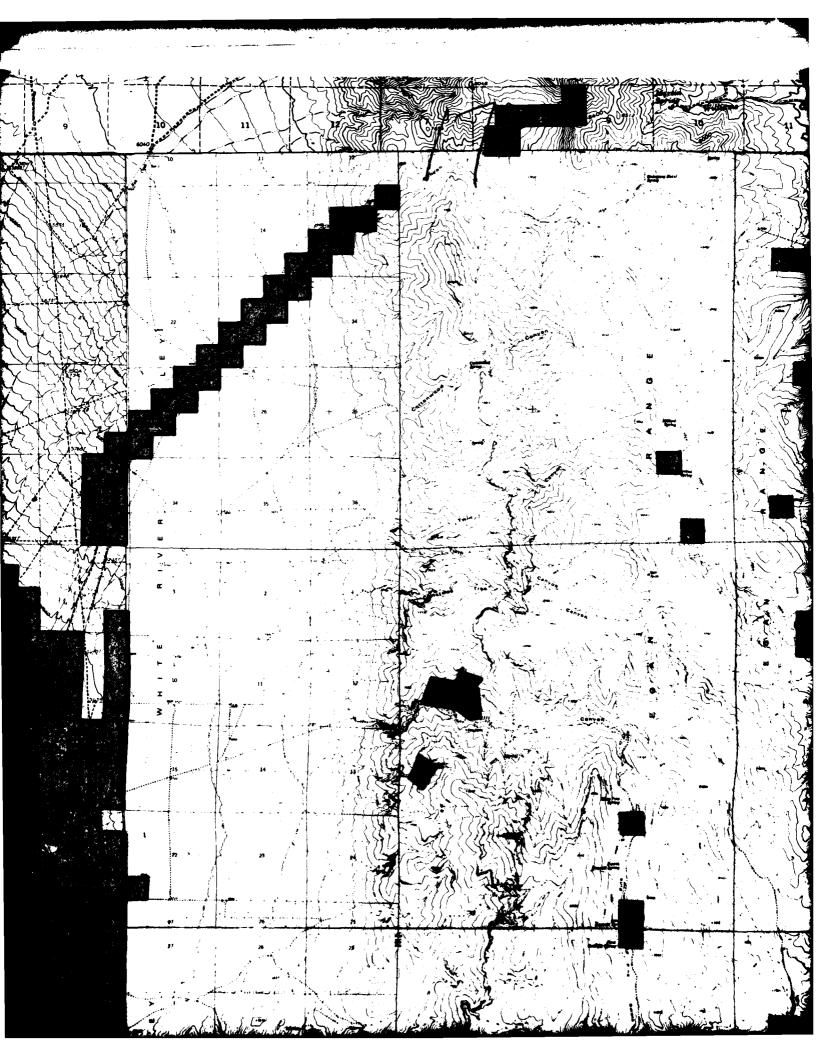


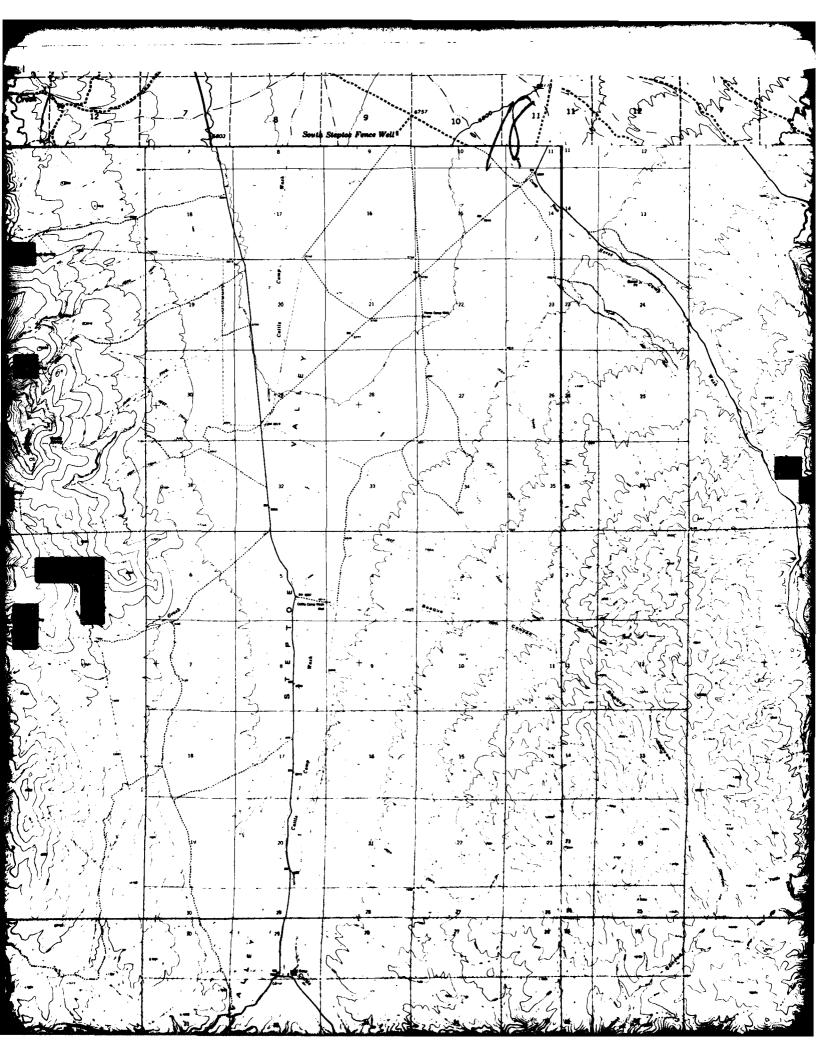


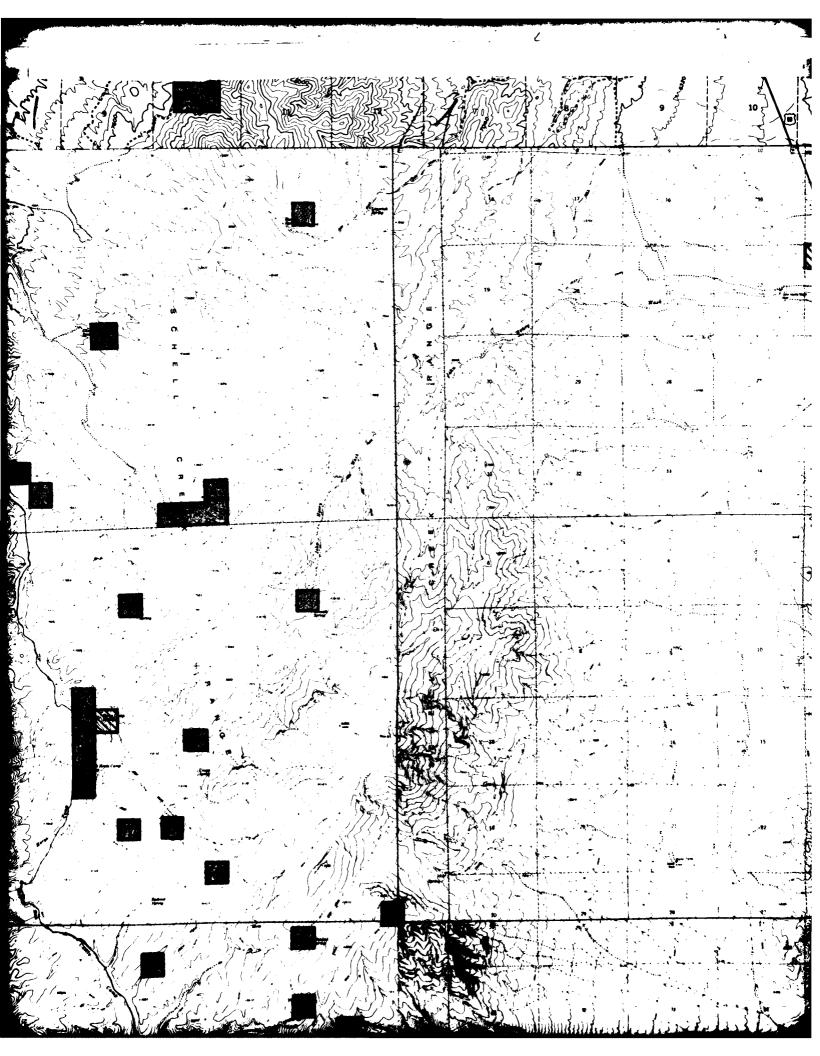


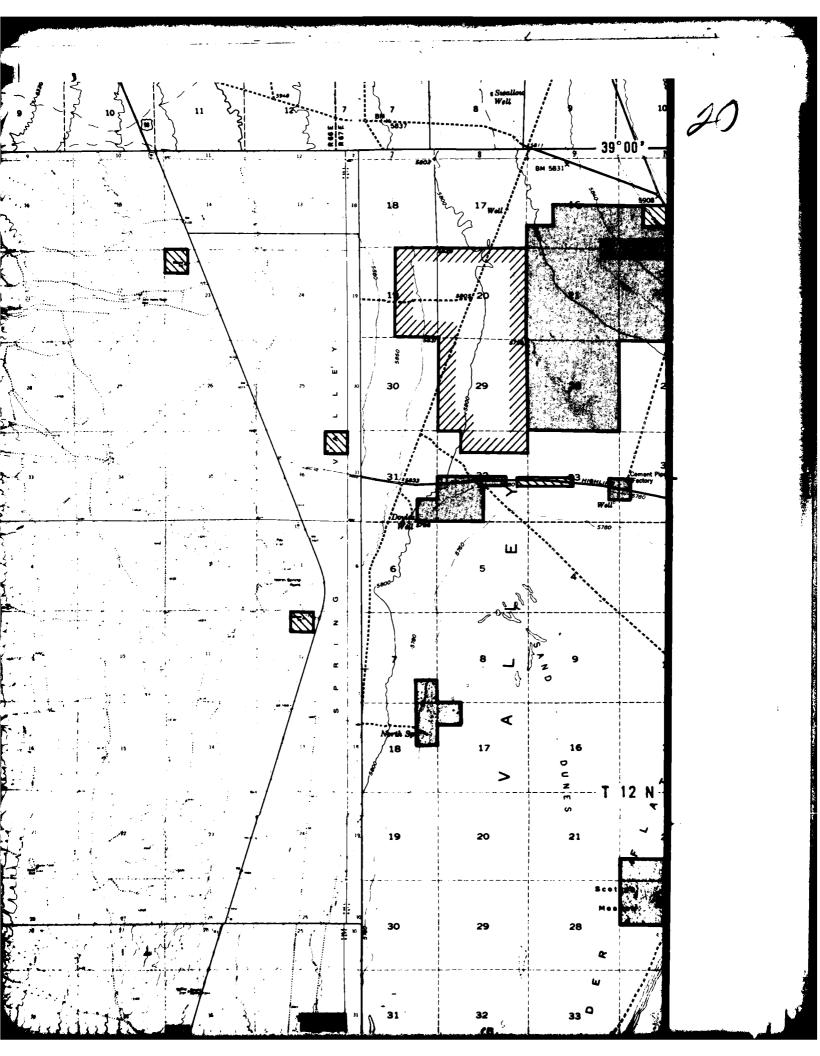


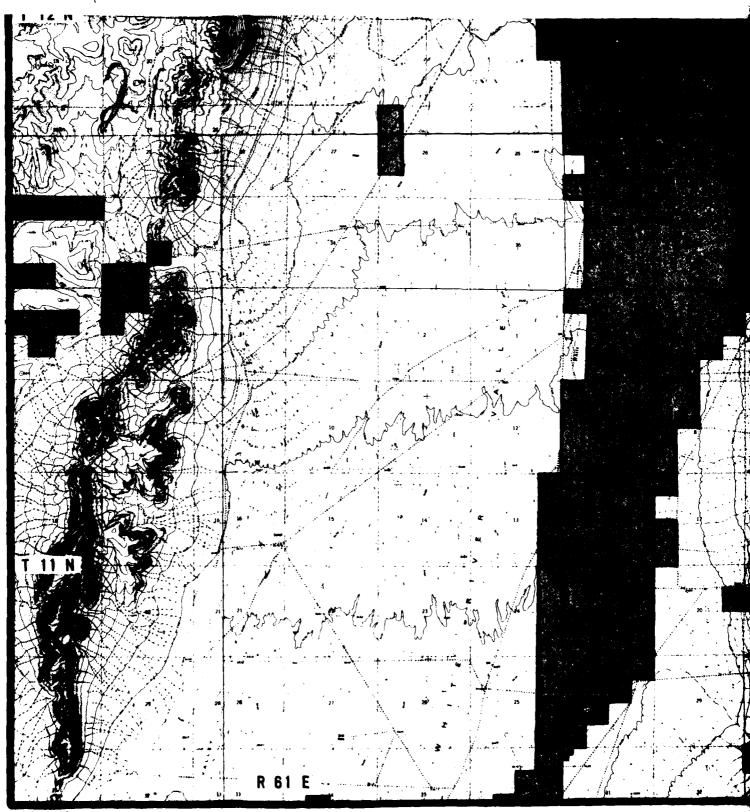




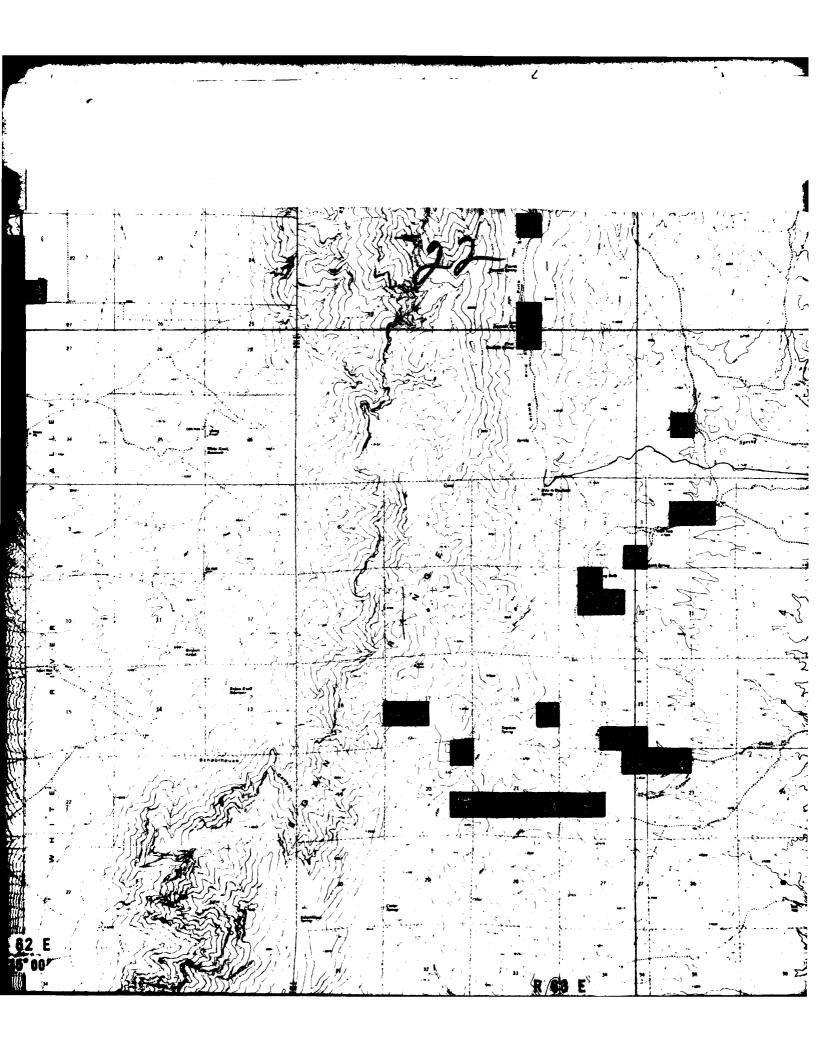


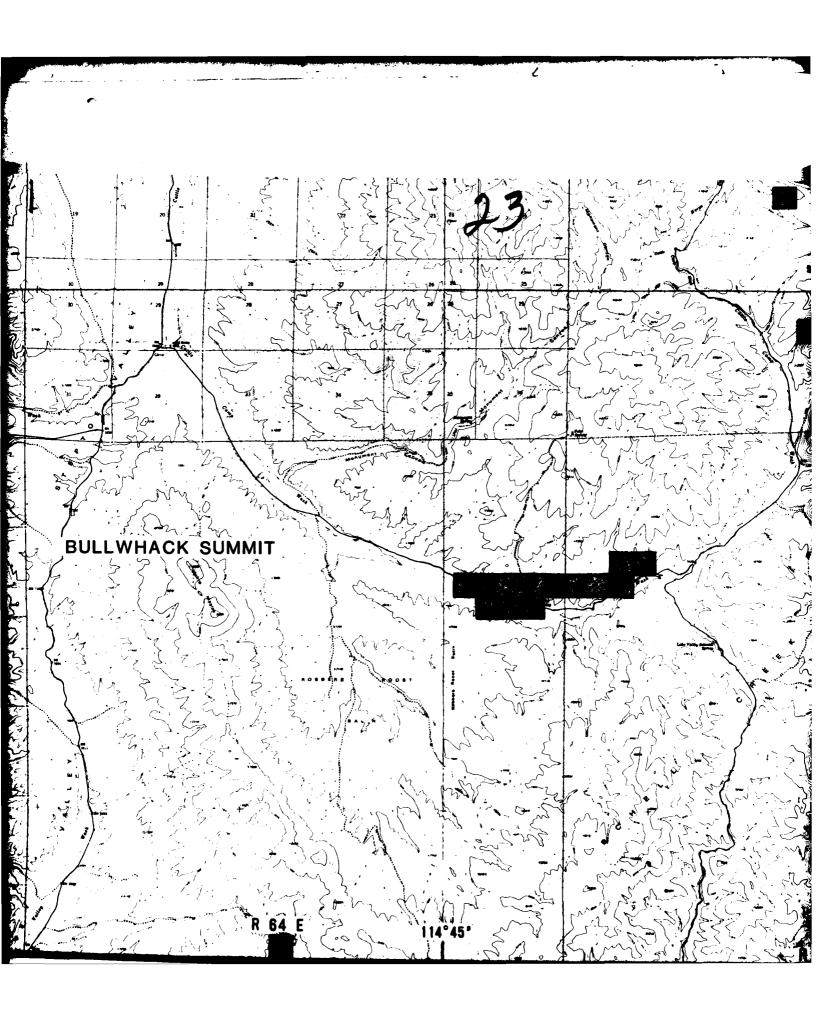


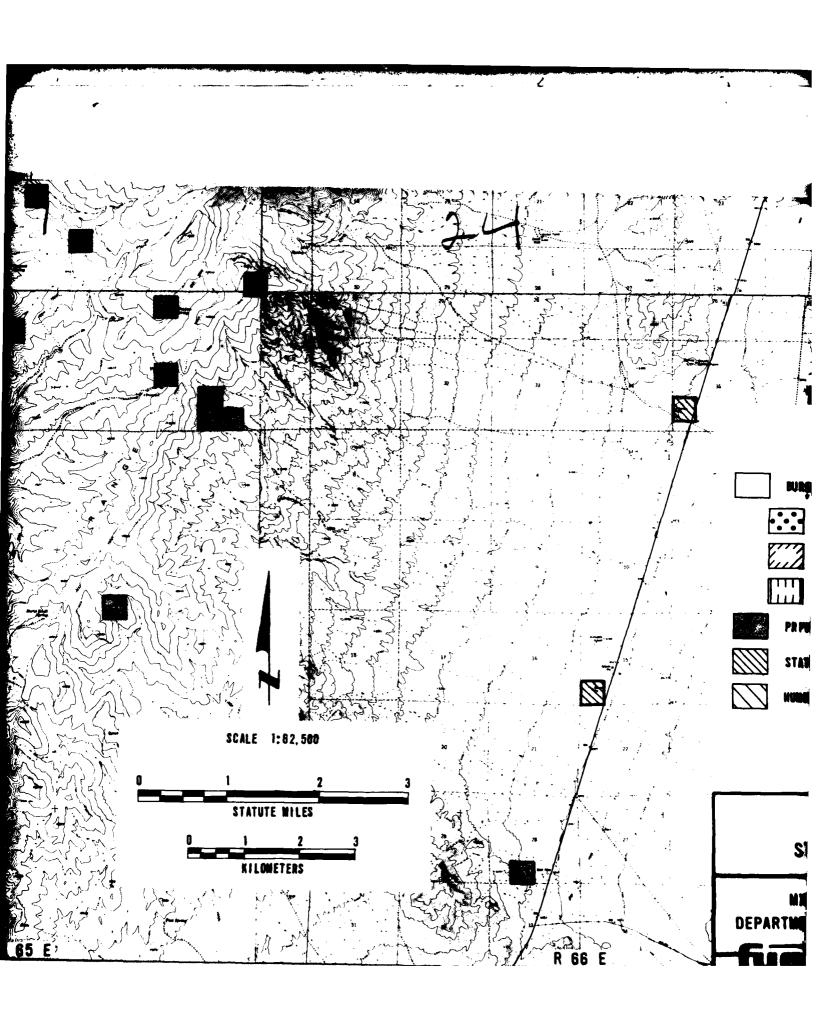




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EXPLANATION

BUREAU OF LAND MANAGEMENT

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DESIGNATED AREA (WITHIN BLM ONLY)

DESERT-LAND ENTRY APPLICATION

AIRPORT LEASE



PRIVATE PROPERTY INCLUDING MINING PATENTS

STATE PROPERTY INCLUDING MATERIAL SITES AND STATE PARKS

1

HUMBELOT NATIONAL FORESTS

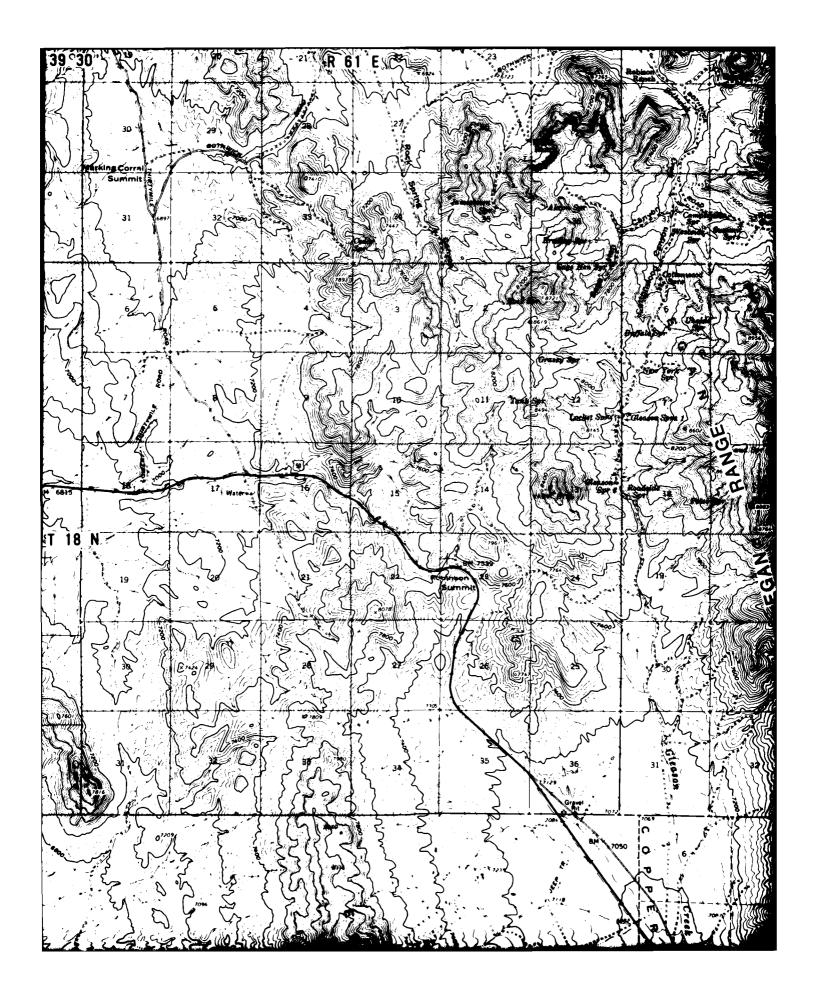
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STEPTOE VALLEY, ELY AREA, NEVADA

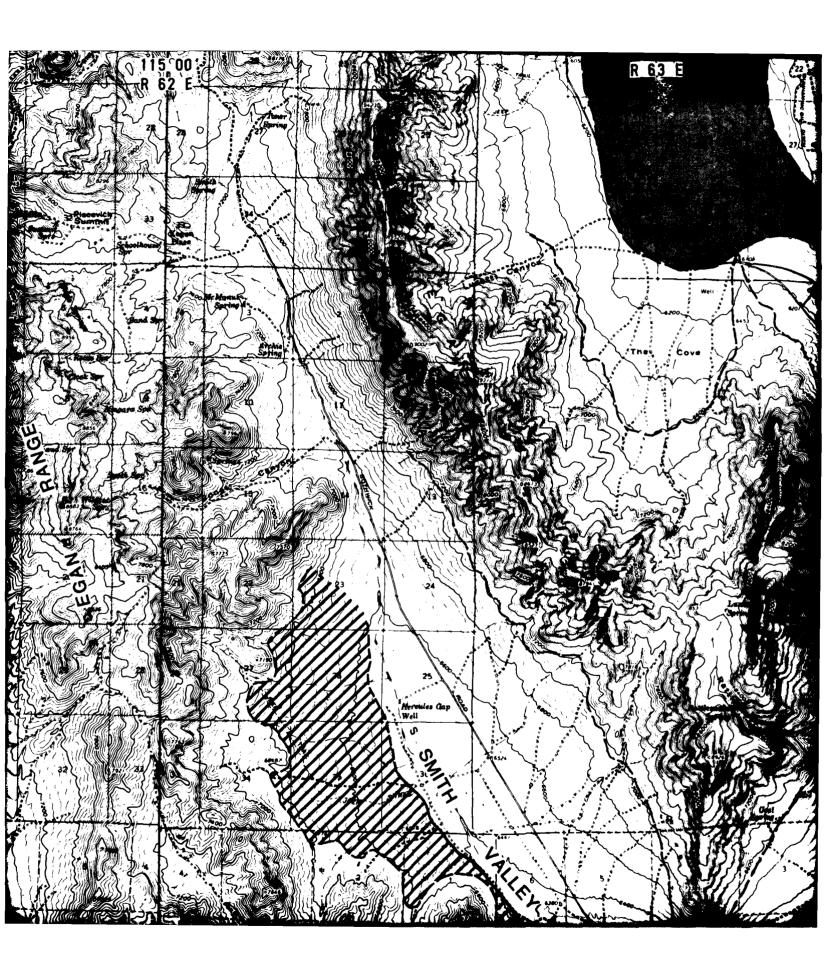
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DEPARTMENT OF THE AIR FORCE - BMO

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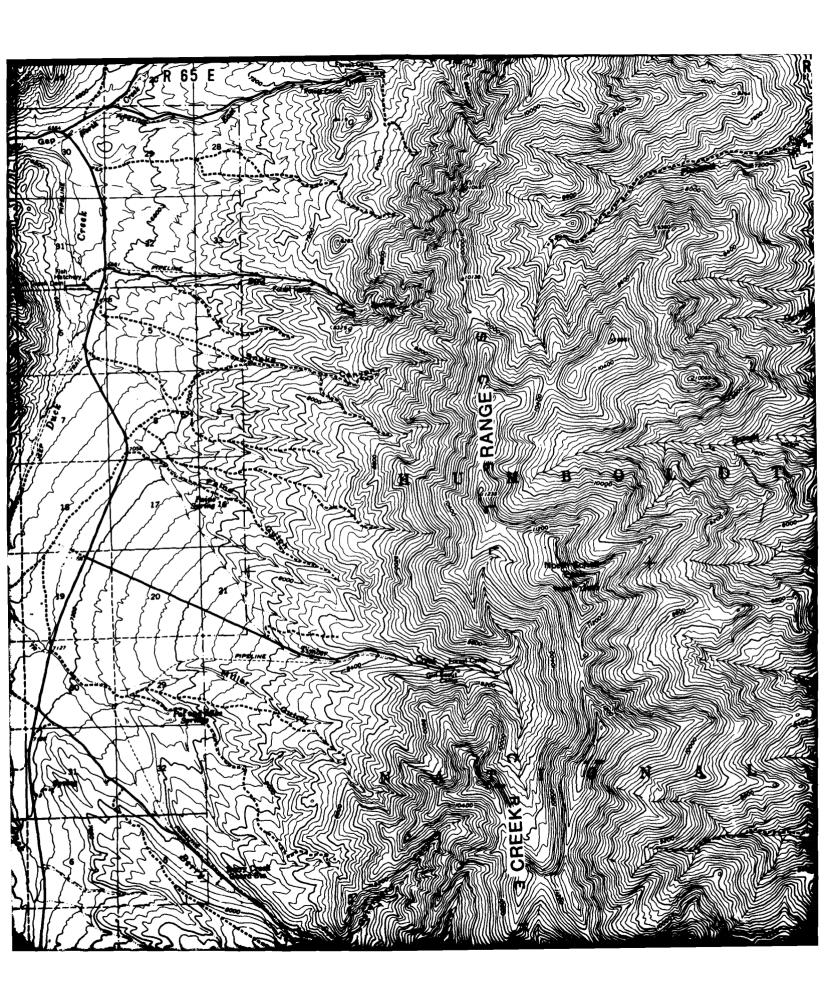
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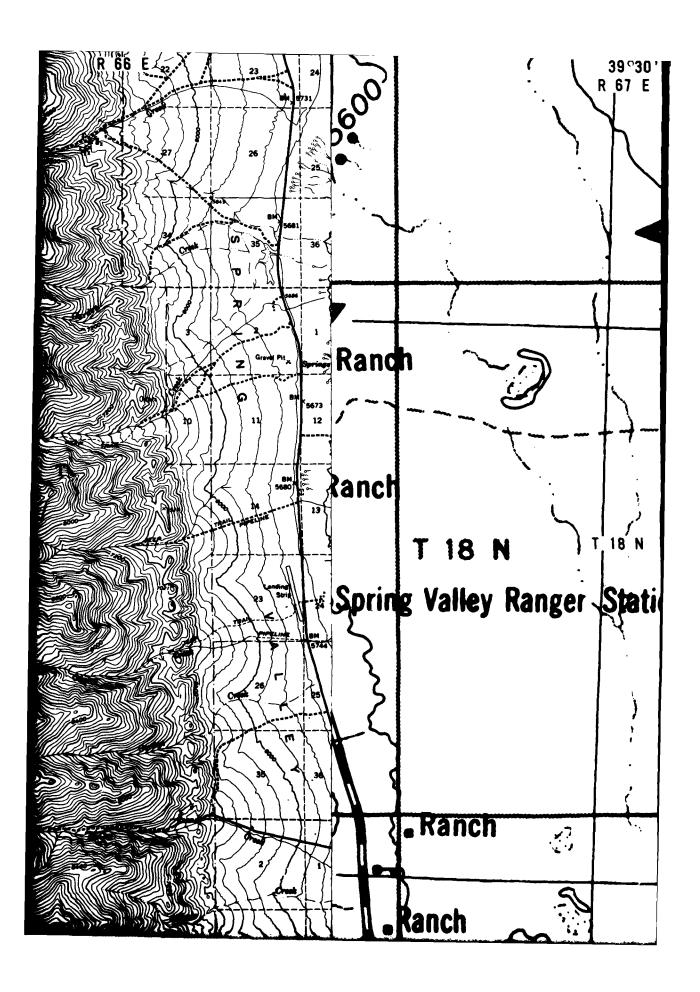
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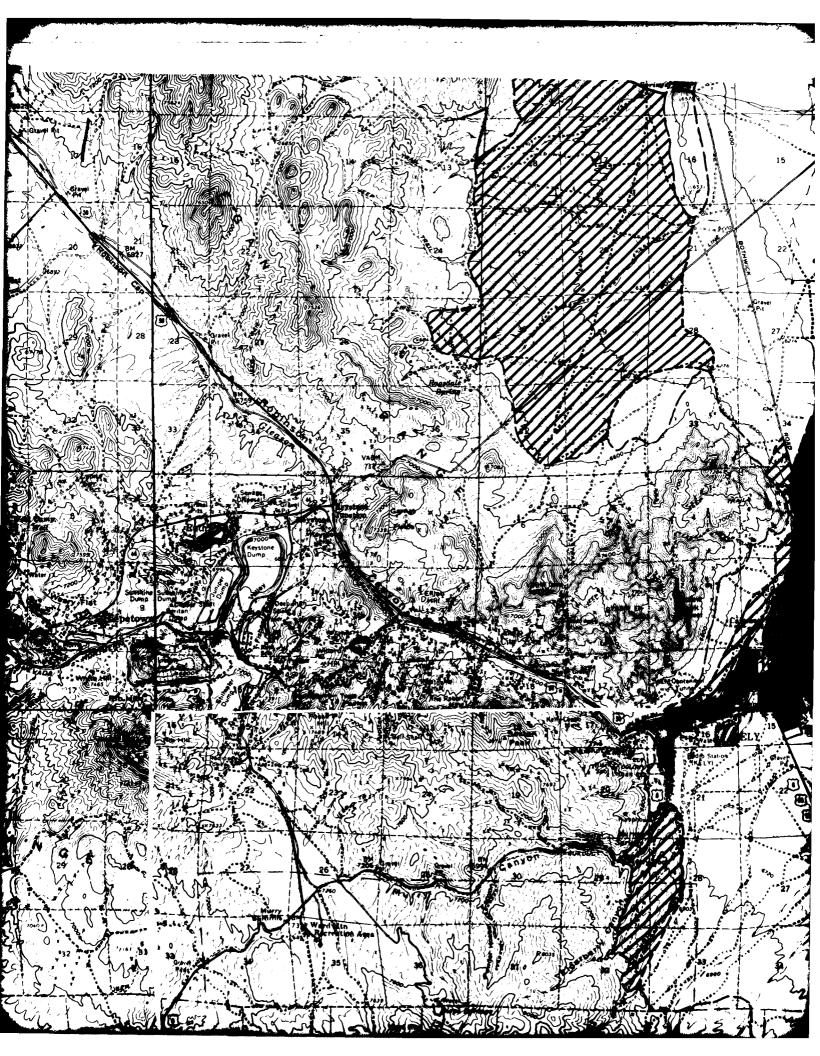


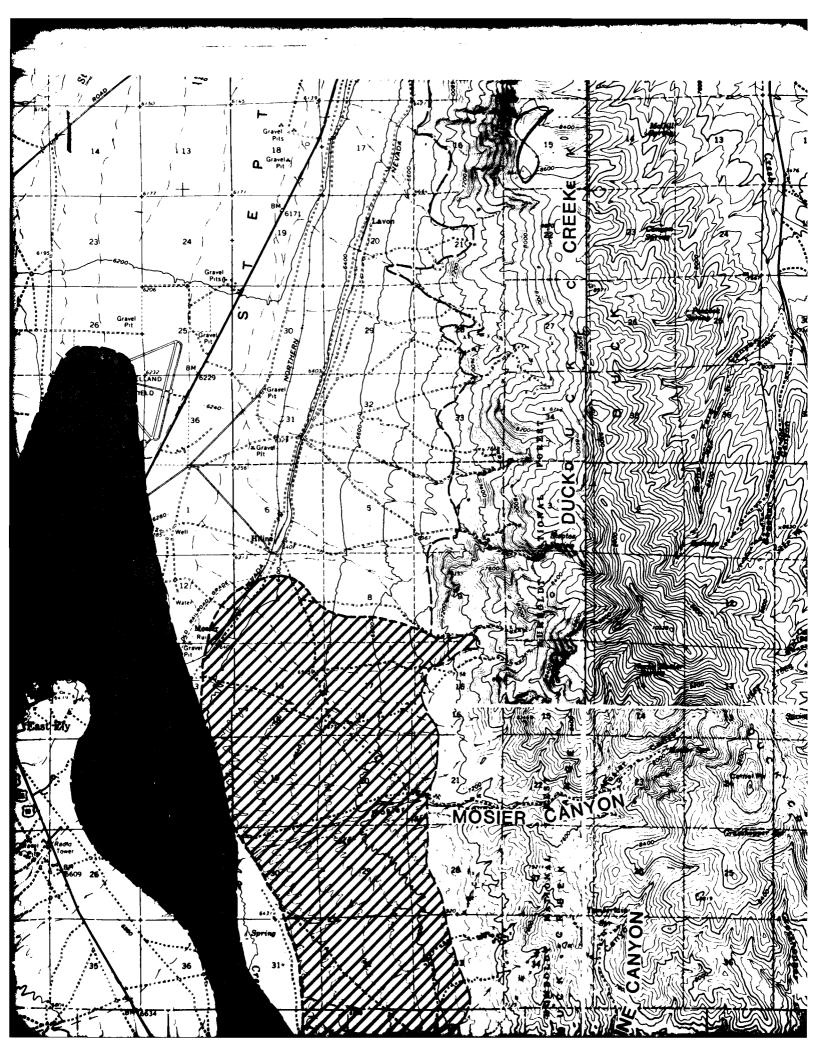


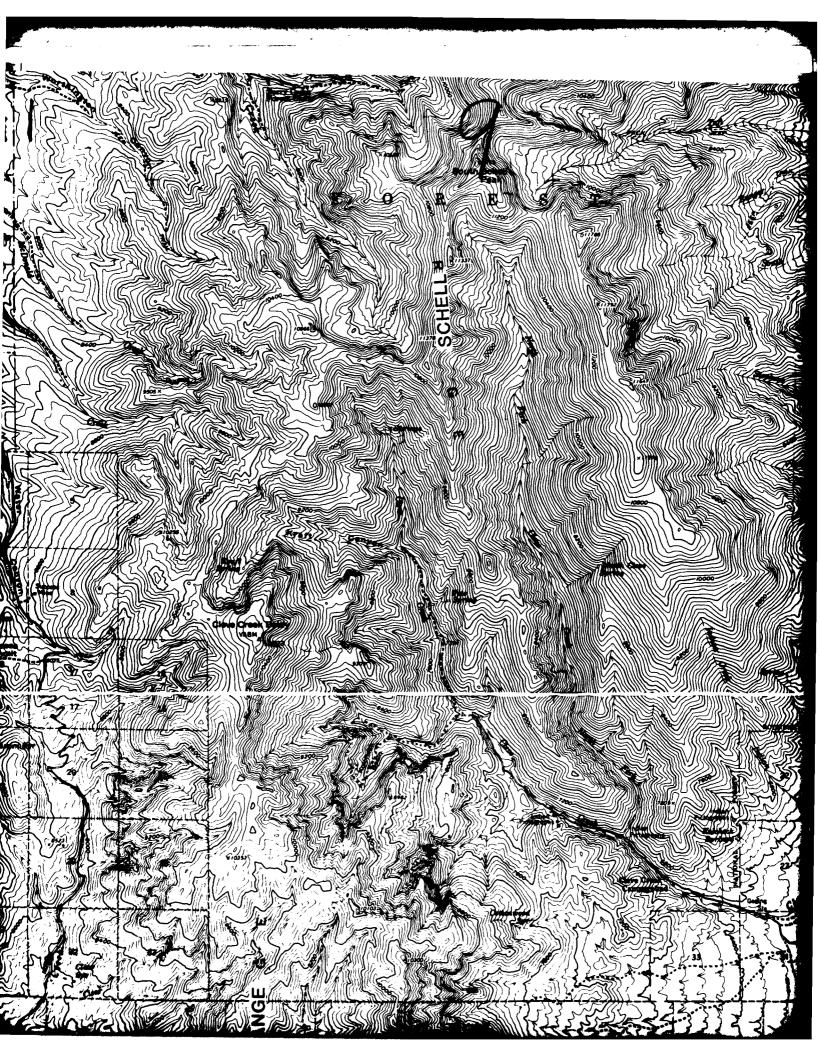


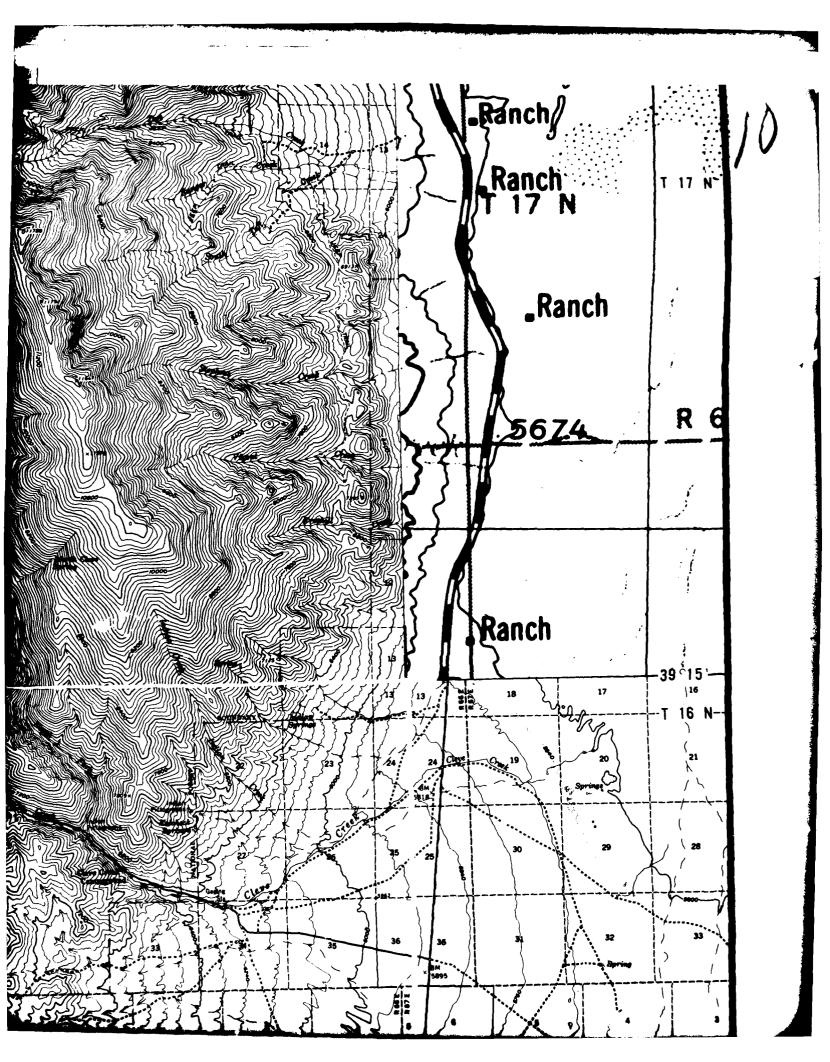


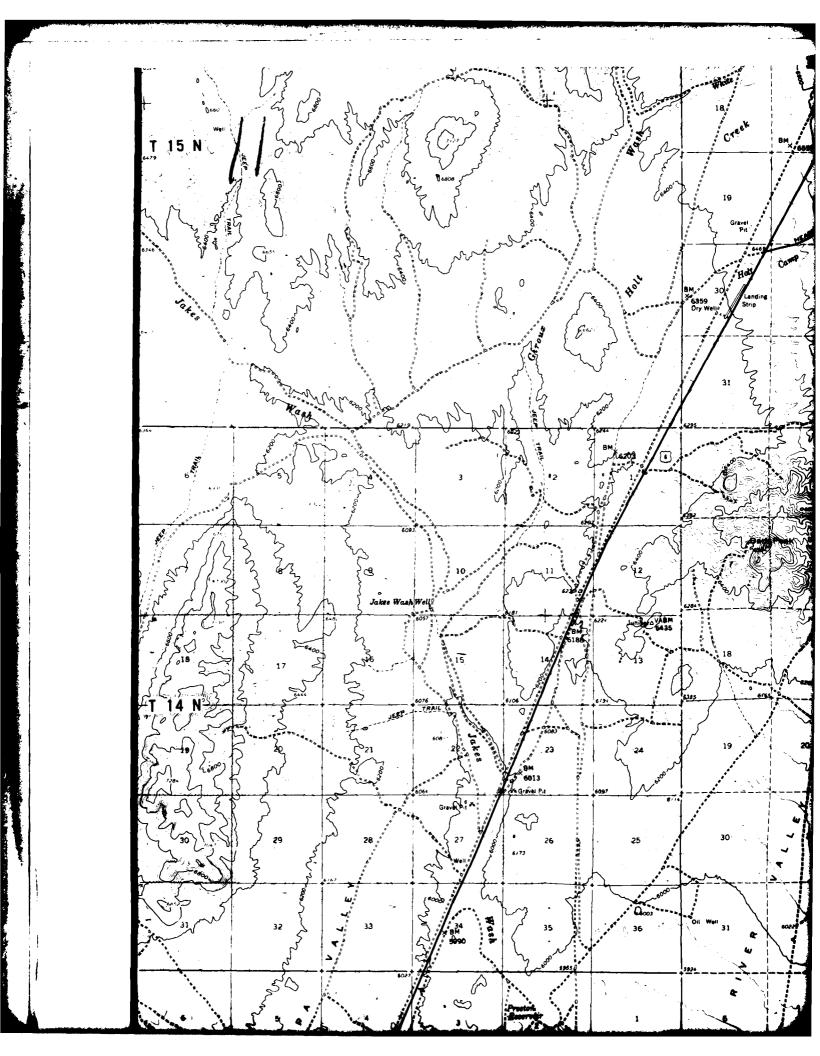


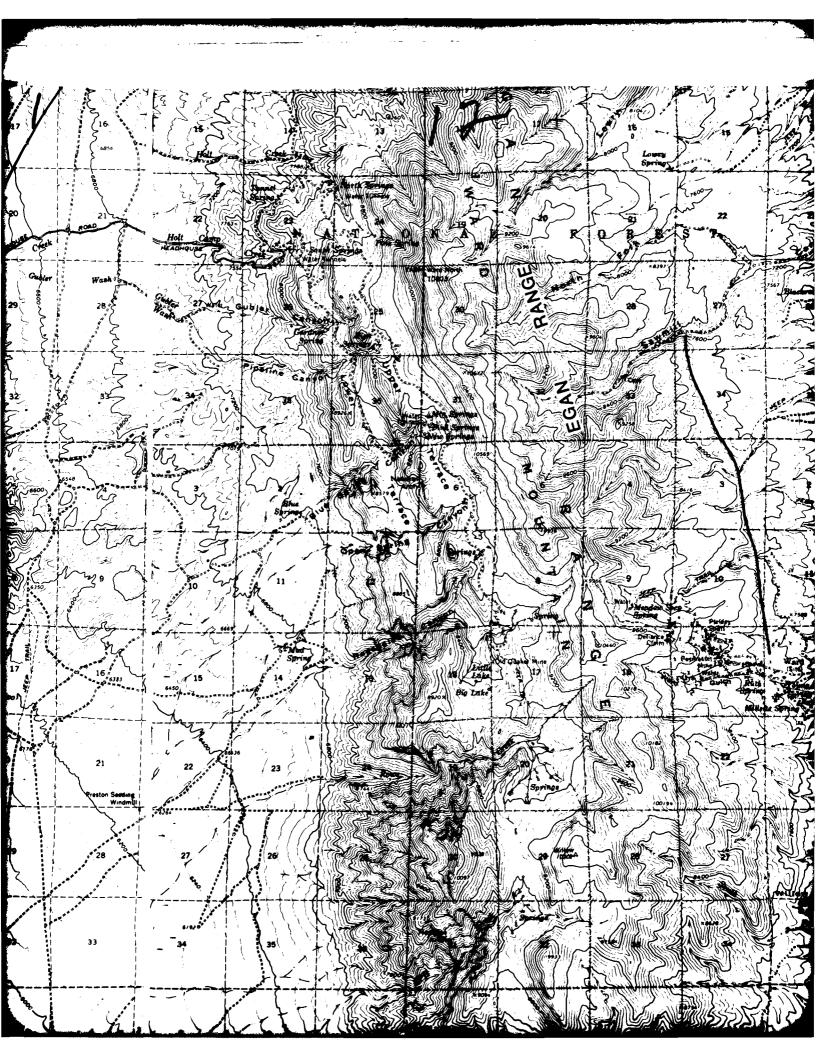


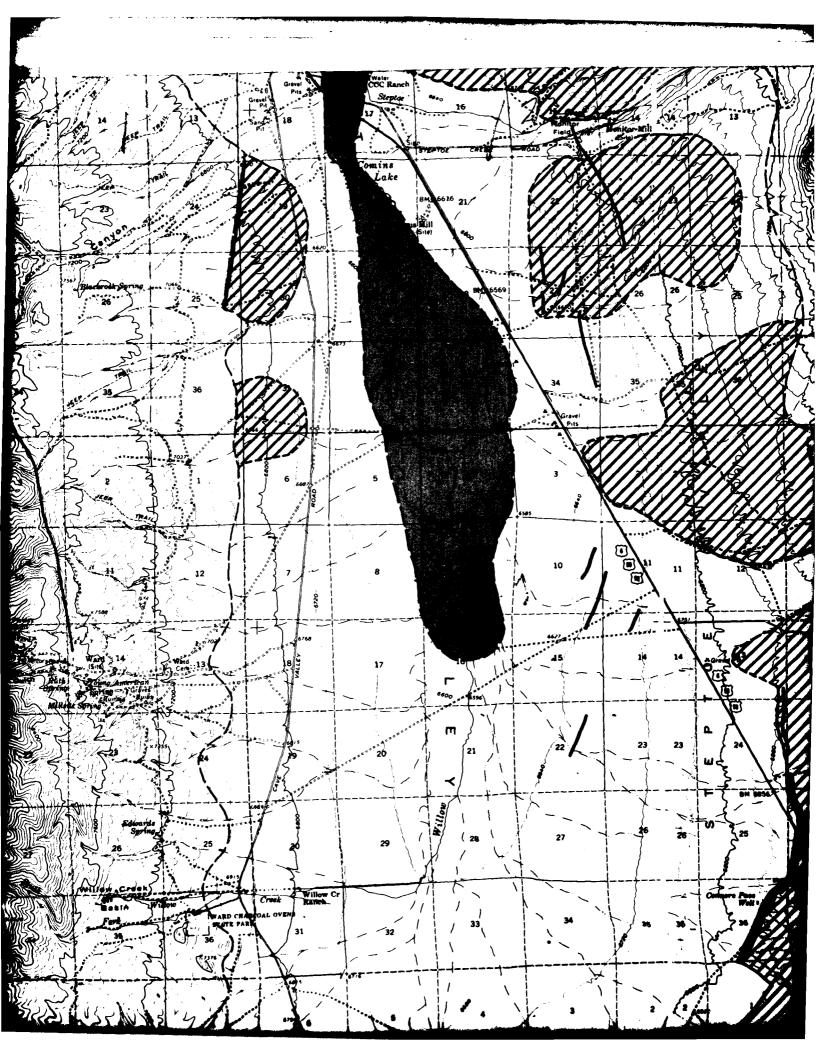


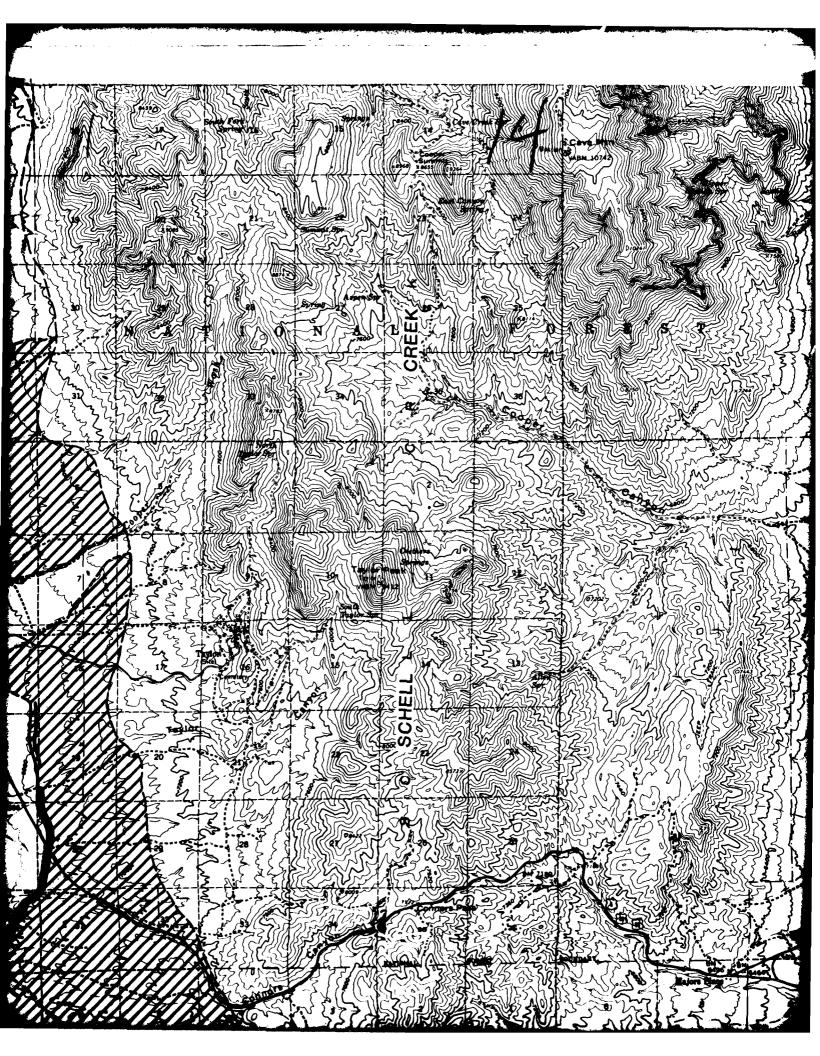


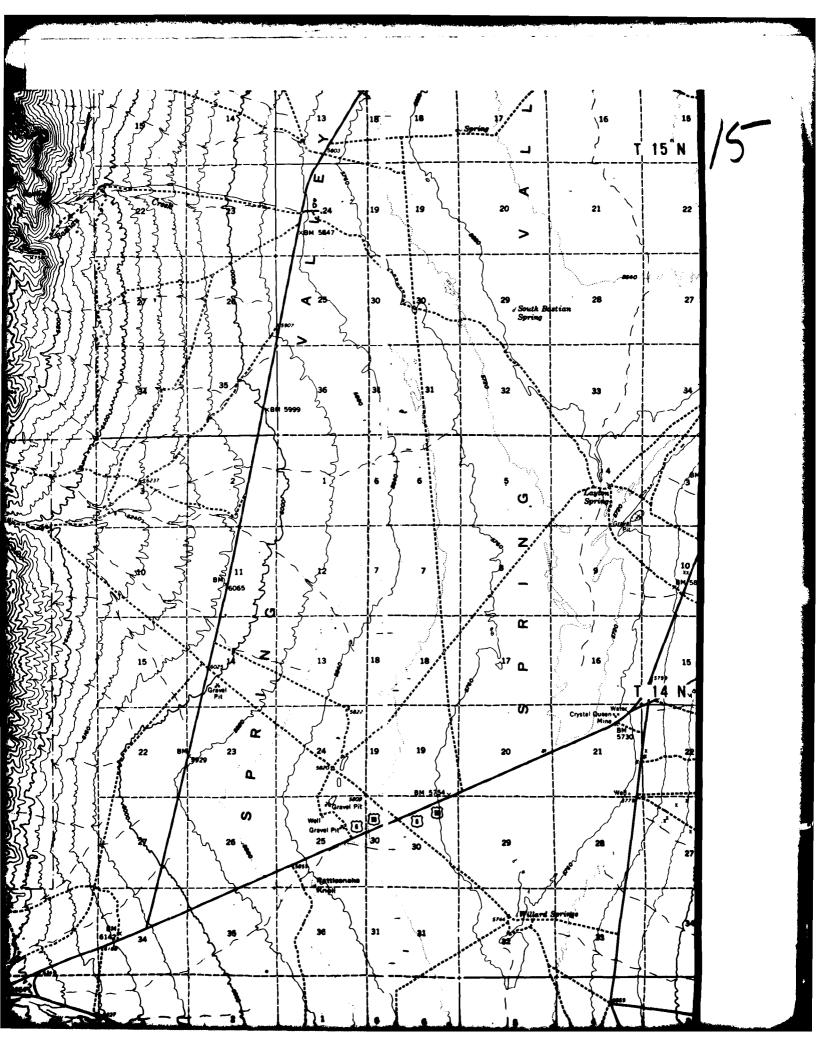


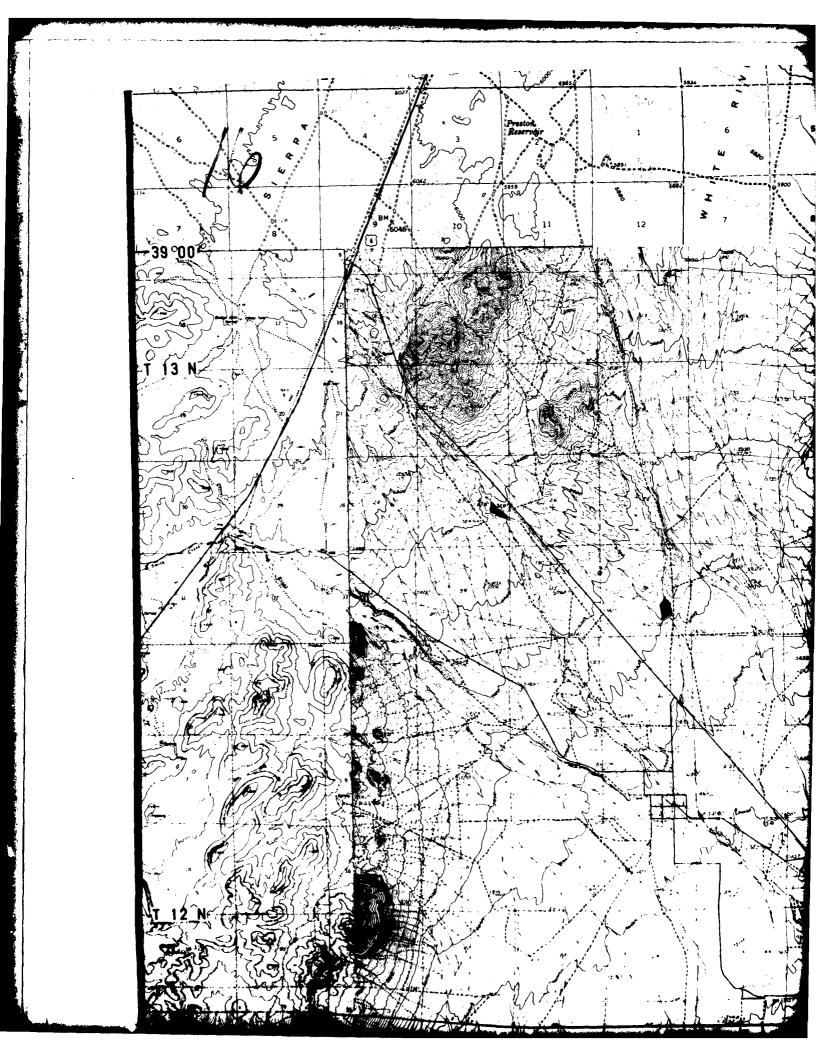


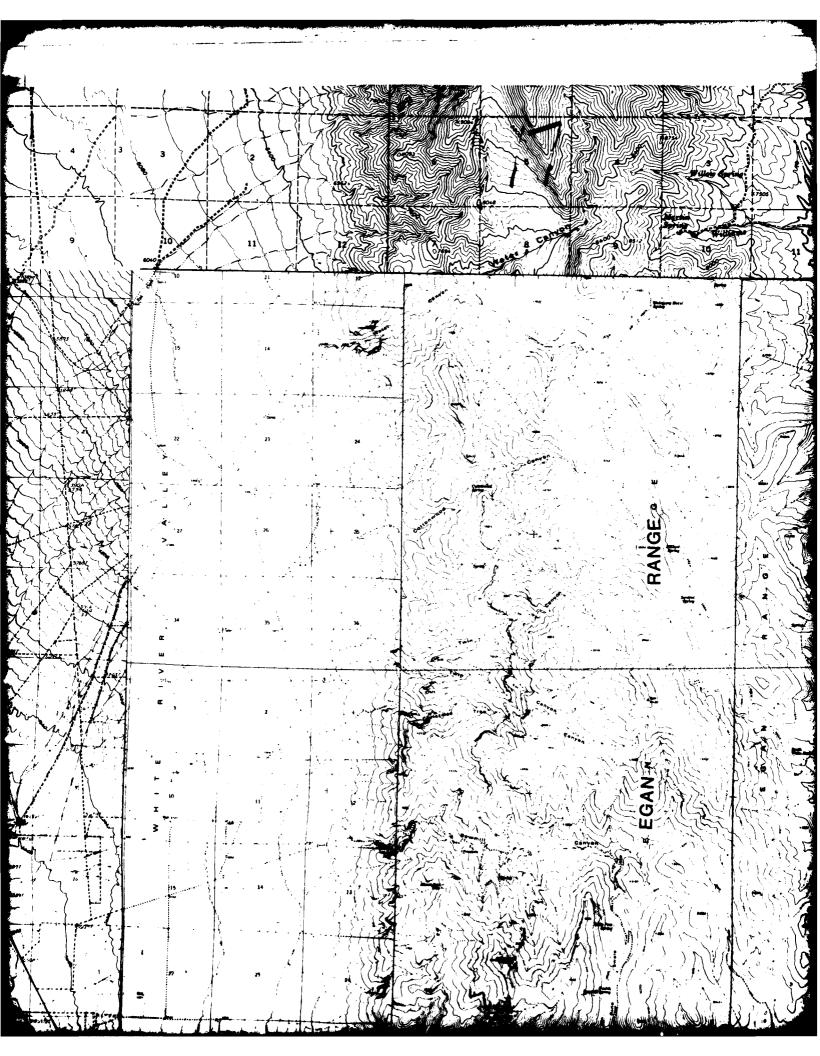


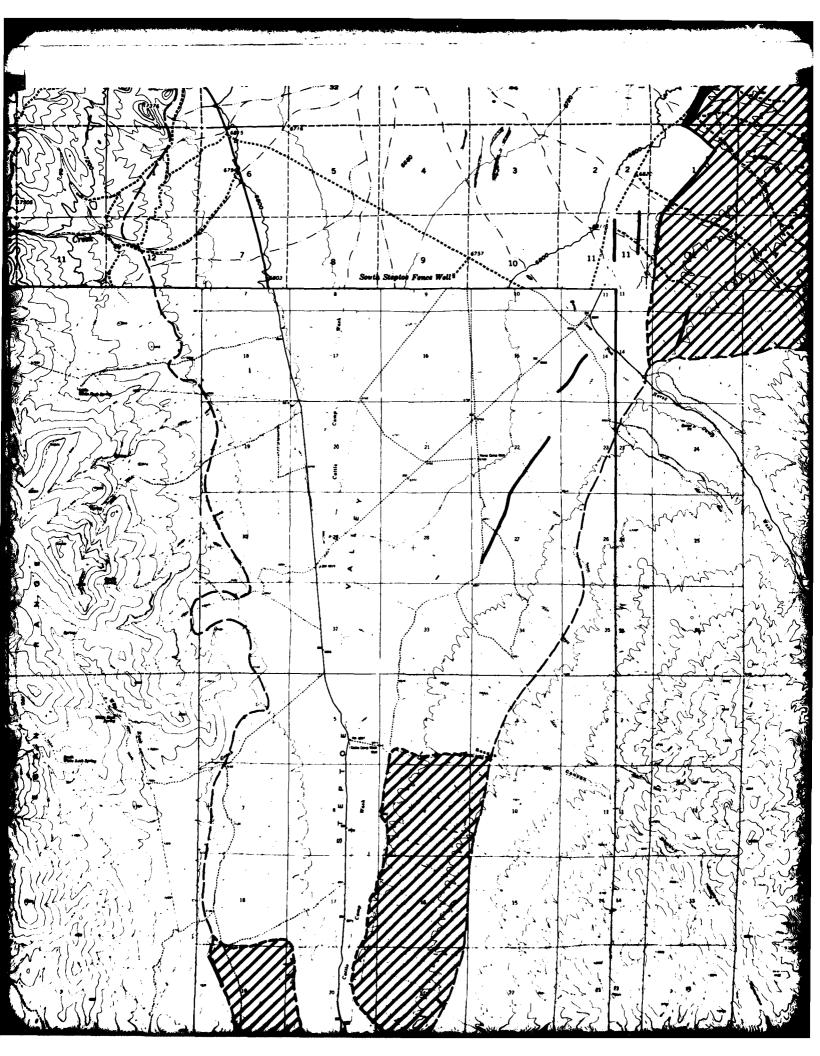


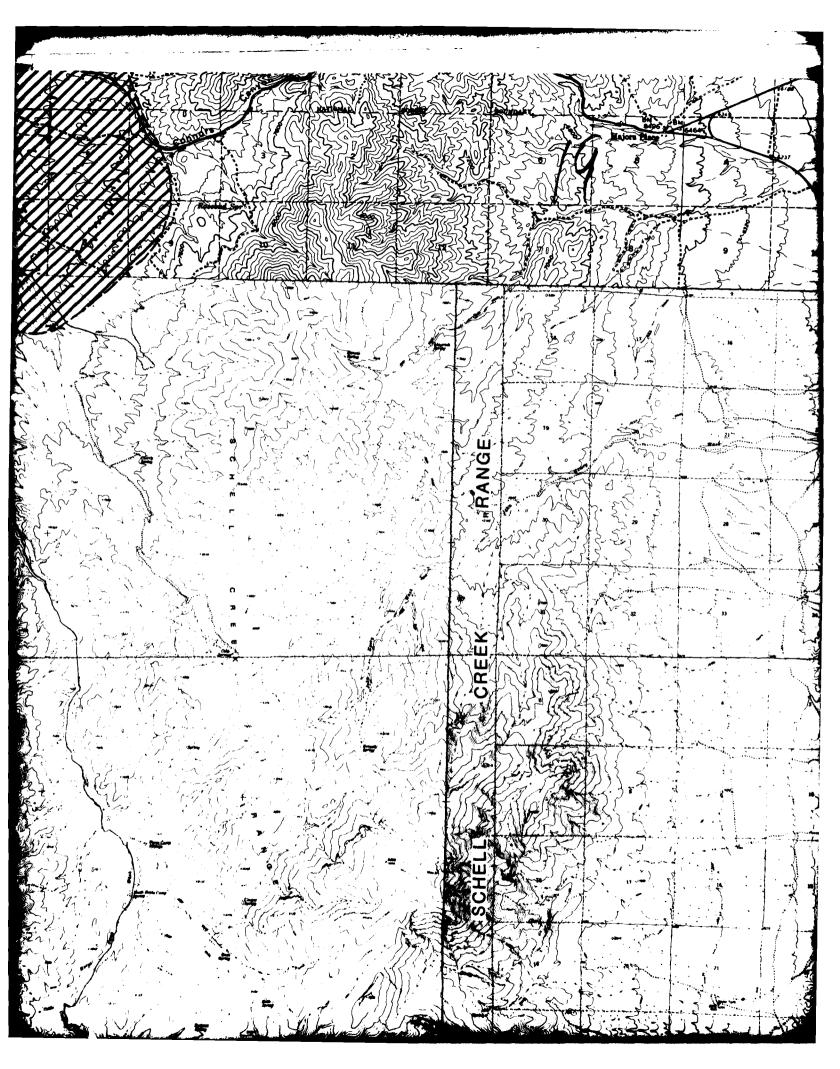


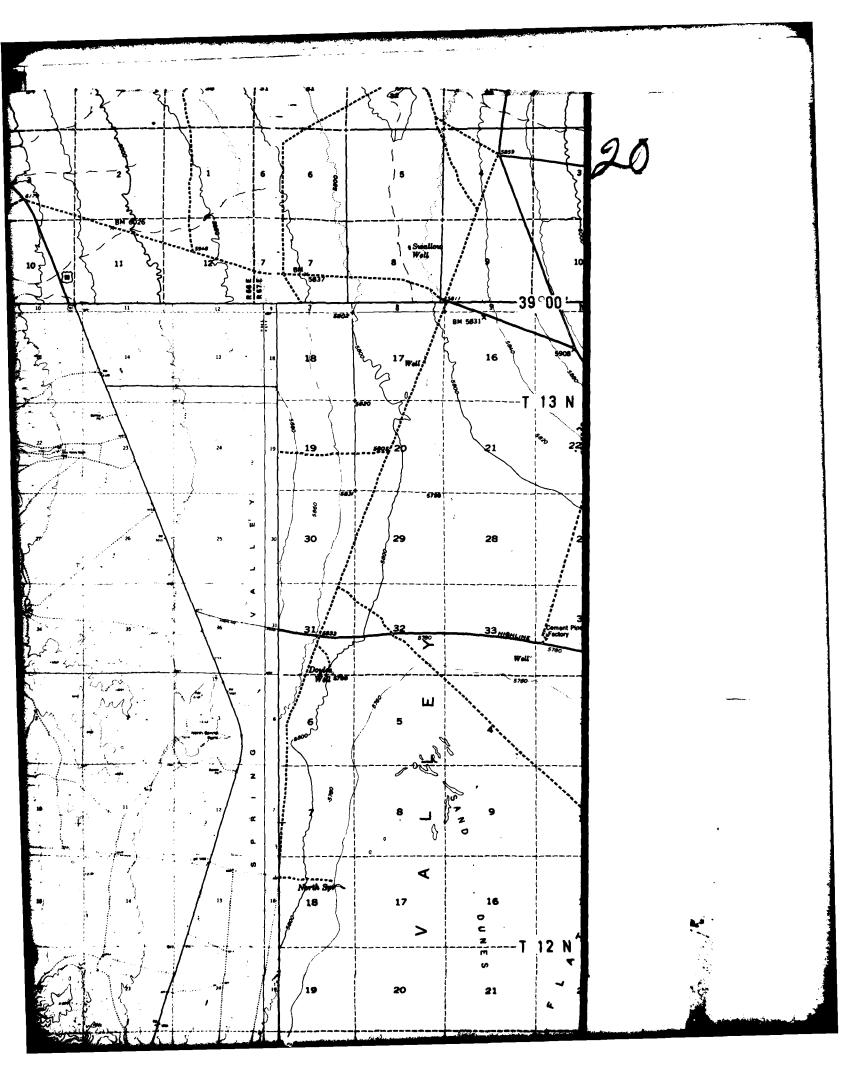


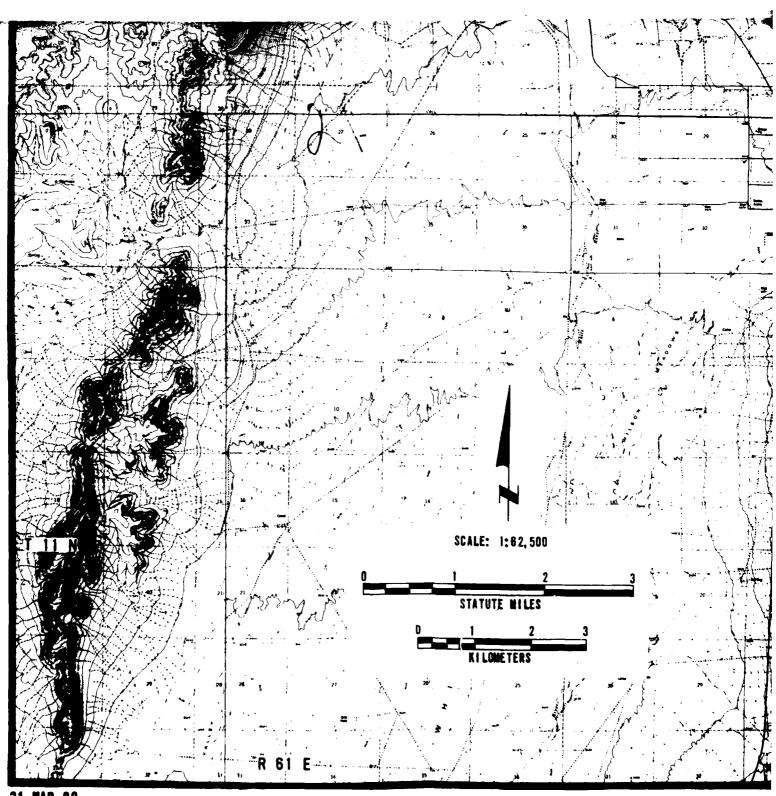




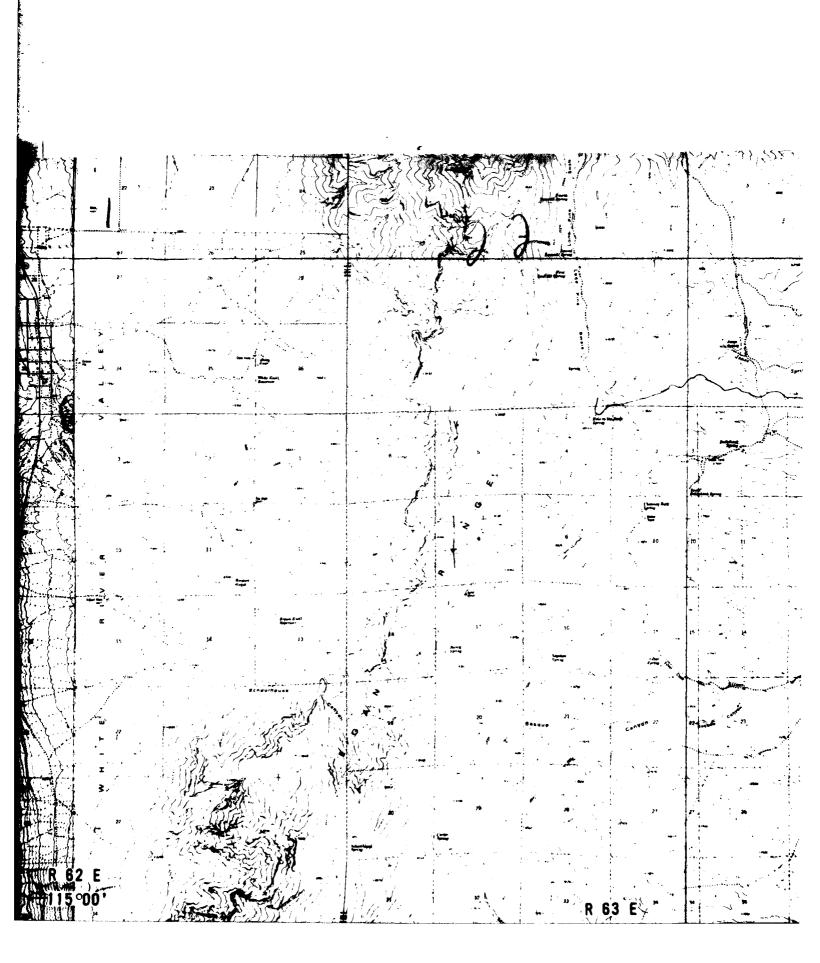








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FUGRO MATIONAL INC LONG BEACH CA
PROPOSED OPERATIONAL BASE SITE, STEPTOE VALLEY, ELY AREA, NEVAD-ETC(U)
FORTON-80-C-0006

NL

LONG
FINATOR-80-C-0006

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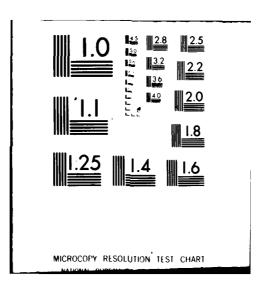
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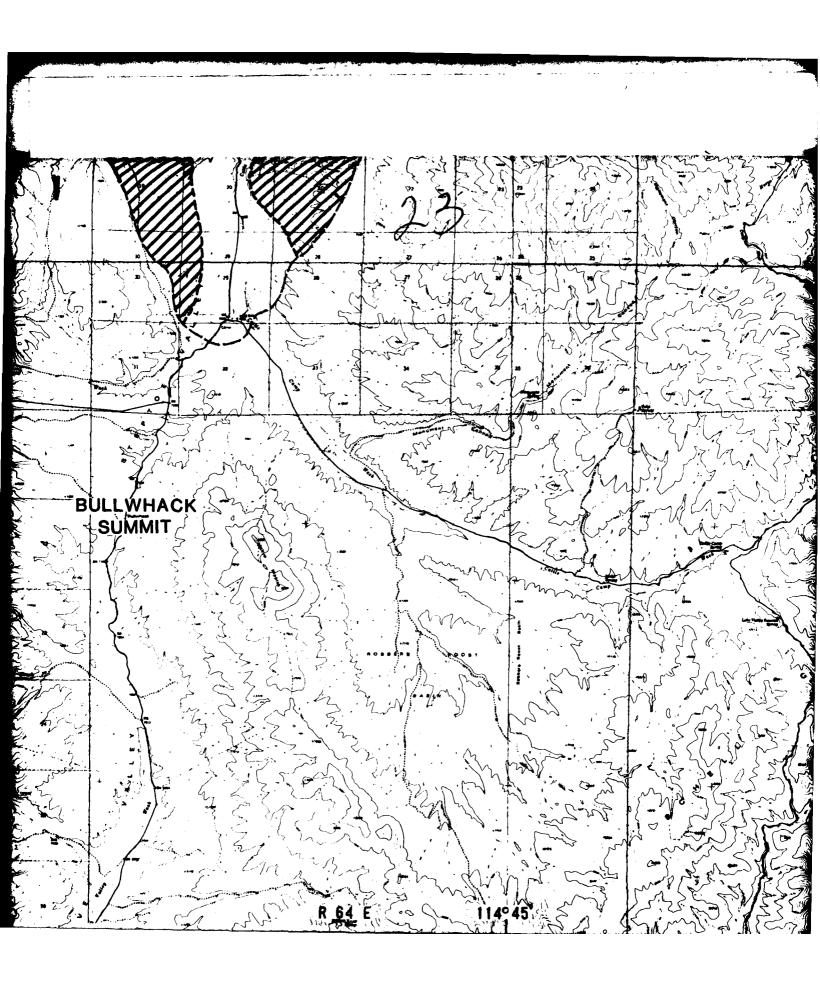
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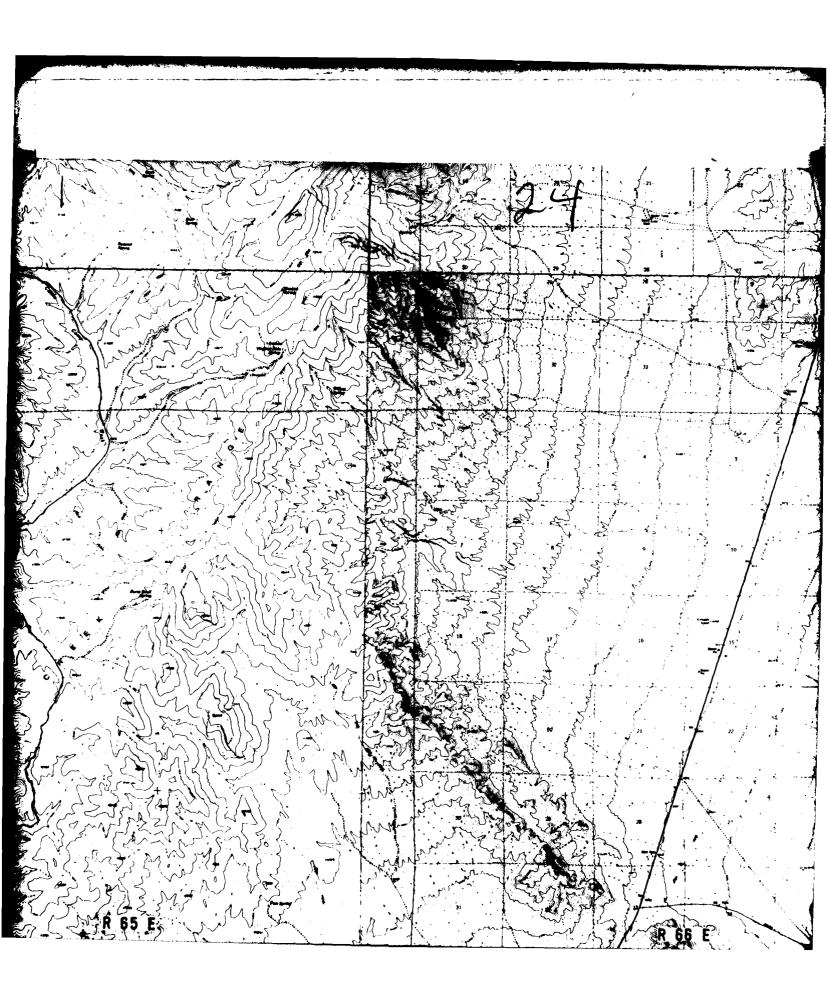
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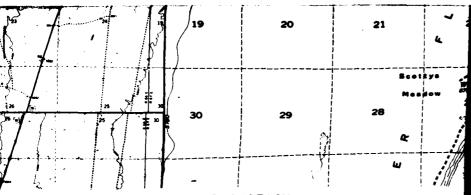
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EXPLANATION

APPROXIMATE ROCK/NON-ROCK BOUNDARY.

1110

ADVERSE TERRAIN, INCLUDING AREAS EXCEEDING 10% GRADE OR MORE THAN HALF OF SLOPES EXCEEDING 10% GRADE, AND AREAS HAVING DRAINAGE DENSITIES AVERAGING AT LEAST TWO 10 FOOT (3 METER) DRAINAGES PER 1000 FEET.

FAULT, AS NOTED ON GEOLOGIC MAP OF NEVADA (1978), MODIFIED BY AERIAL PHOTO INTERPRETATION.

POSSIBLE FAULTS AND FAULT RELATED FEATURES INTERPRETED FROM AERIAL PHOTOS.

DEPTH TO WATER GENERALLY LESS THAN 20 FEET.

GEOTECHNICAL CONDITIONS
STEPTOE VALLEY. ELY AREA. NEVADA

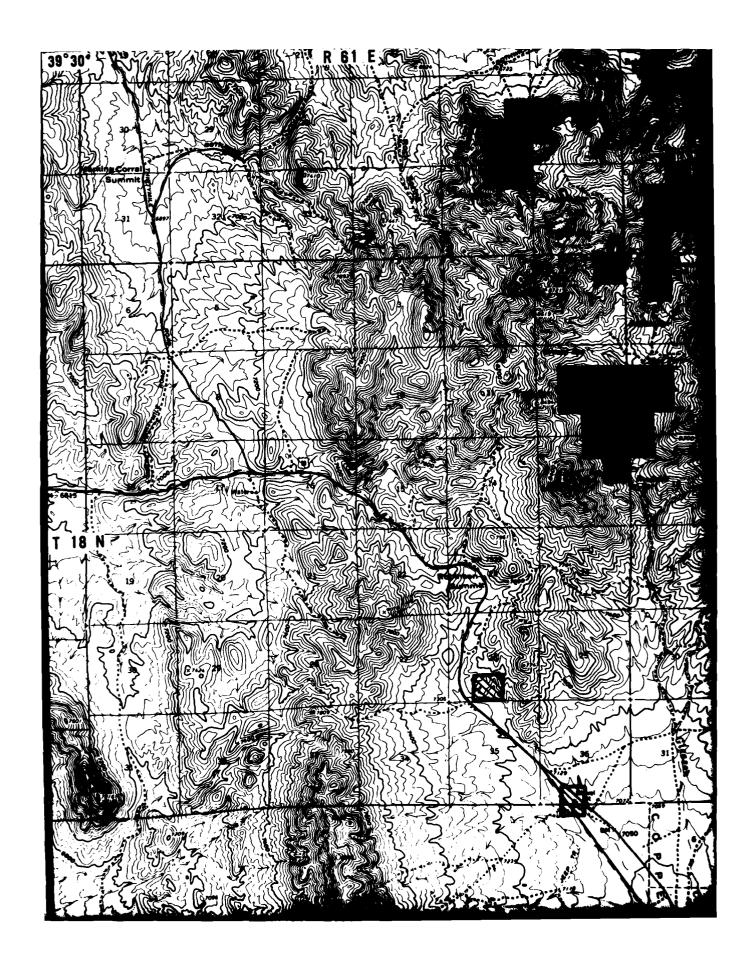
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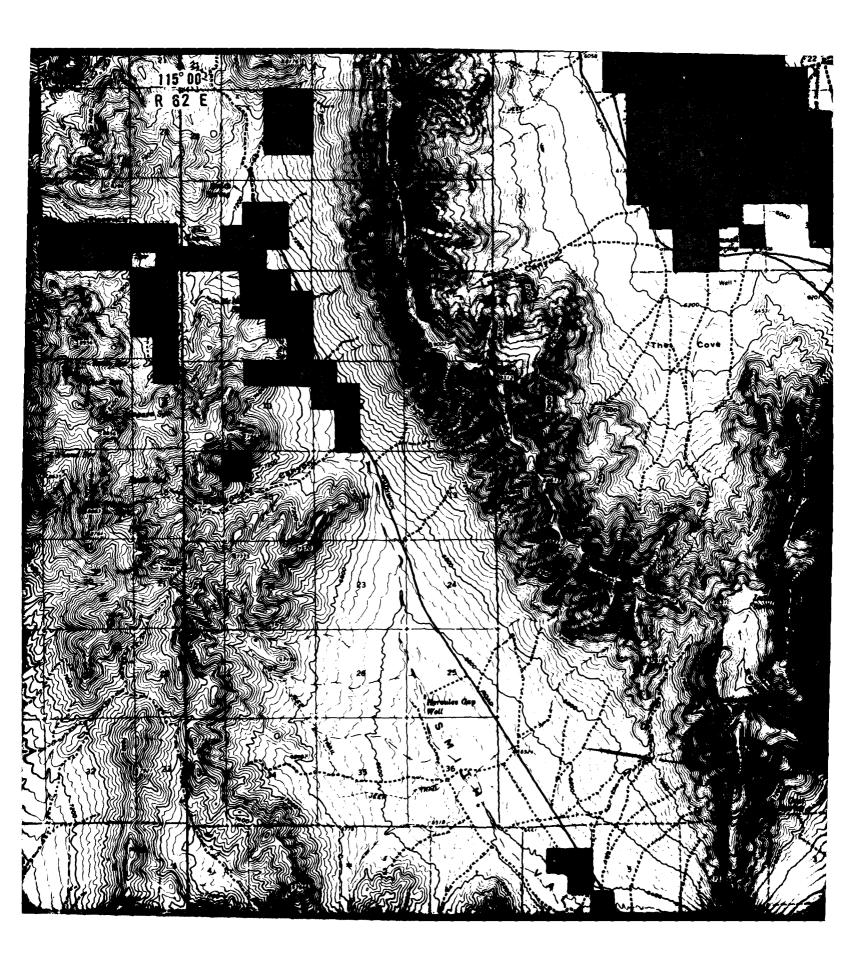
DEPARTMENT OF THE AIR FORCE - DMO

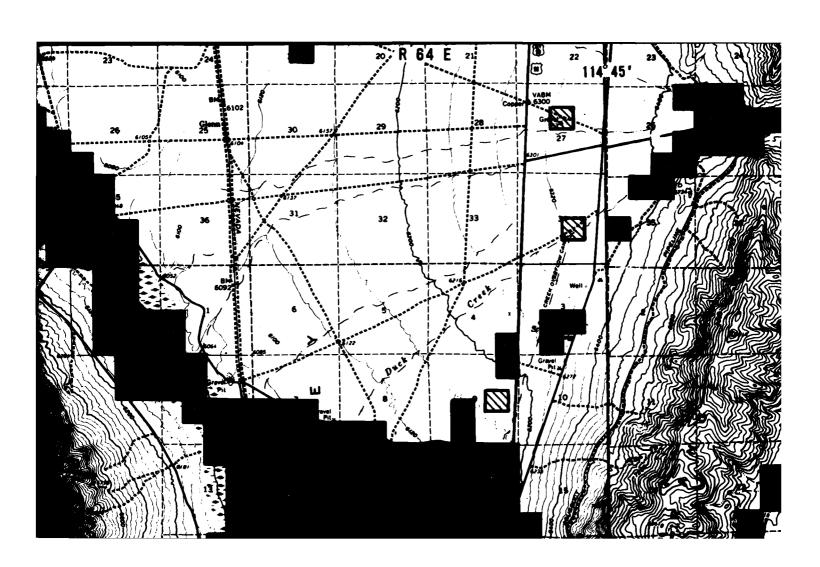
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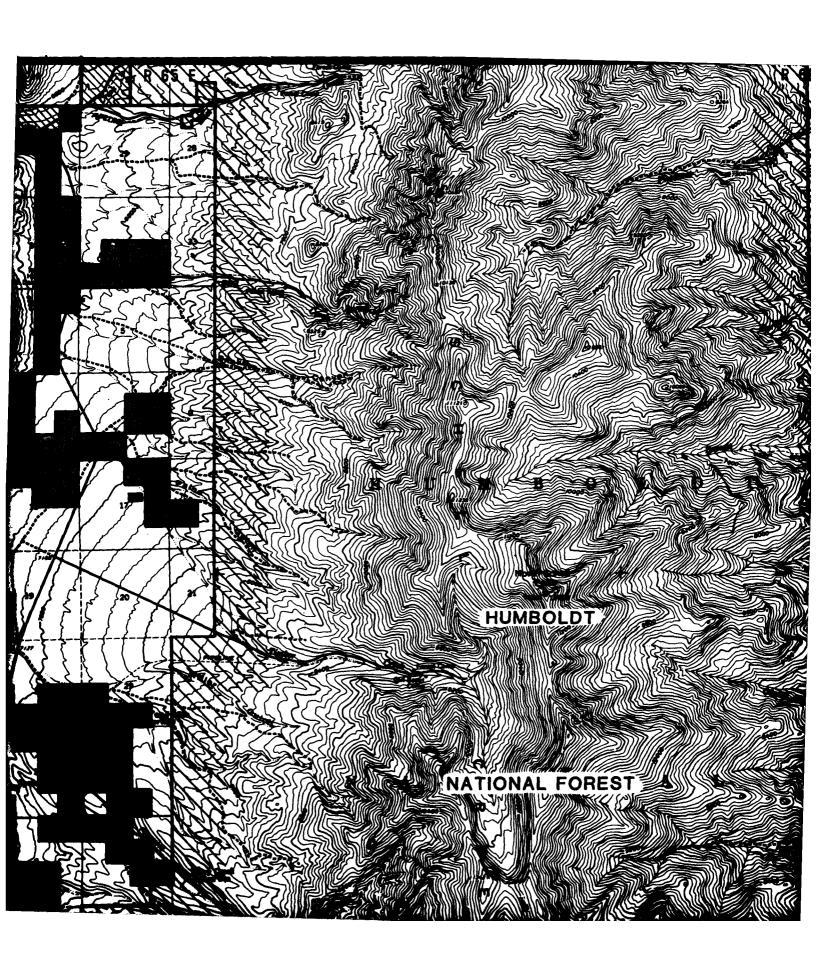
5-1

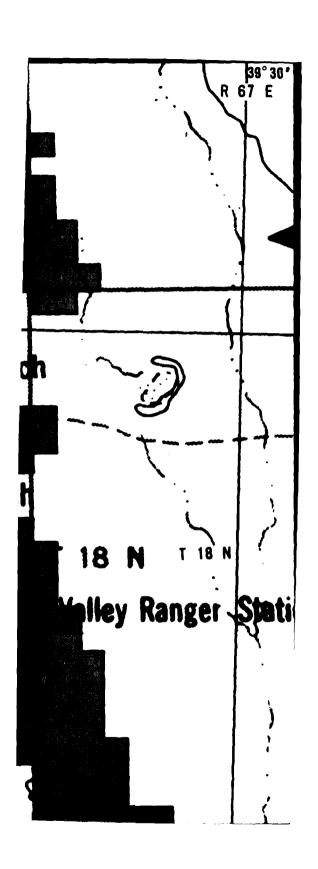
TUERO NATIONAL INC.

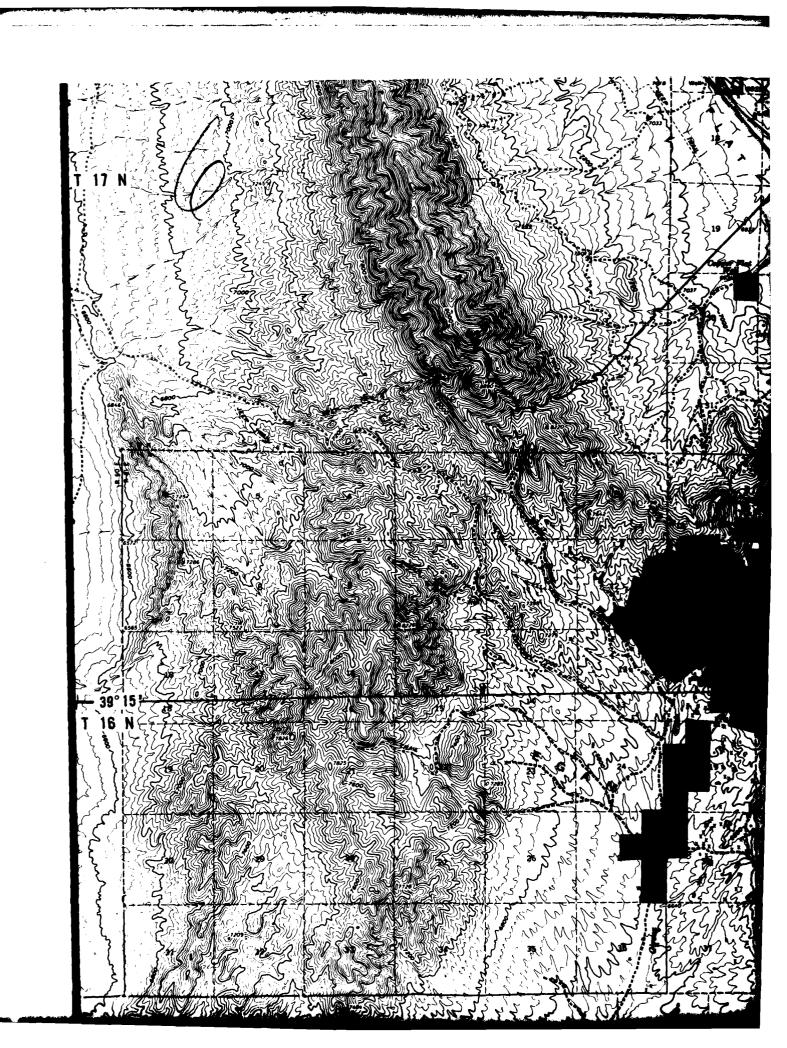


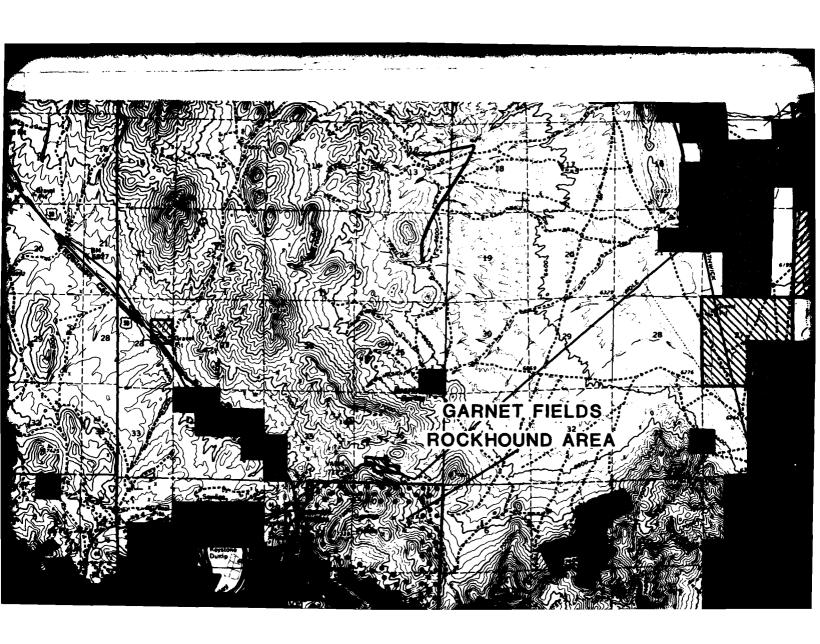


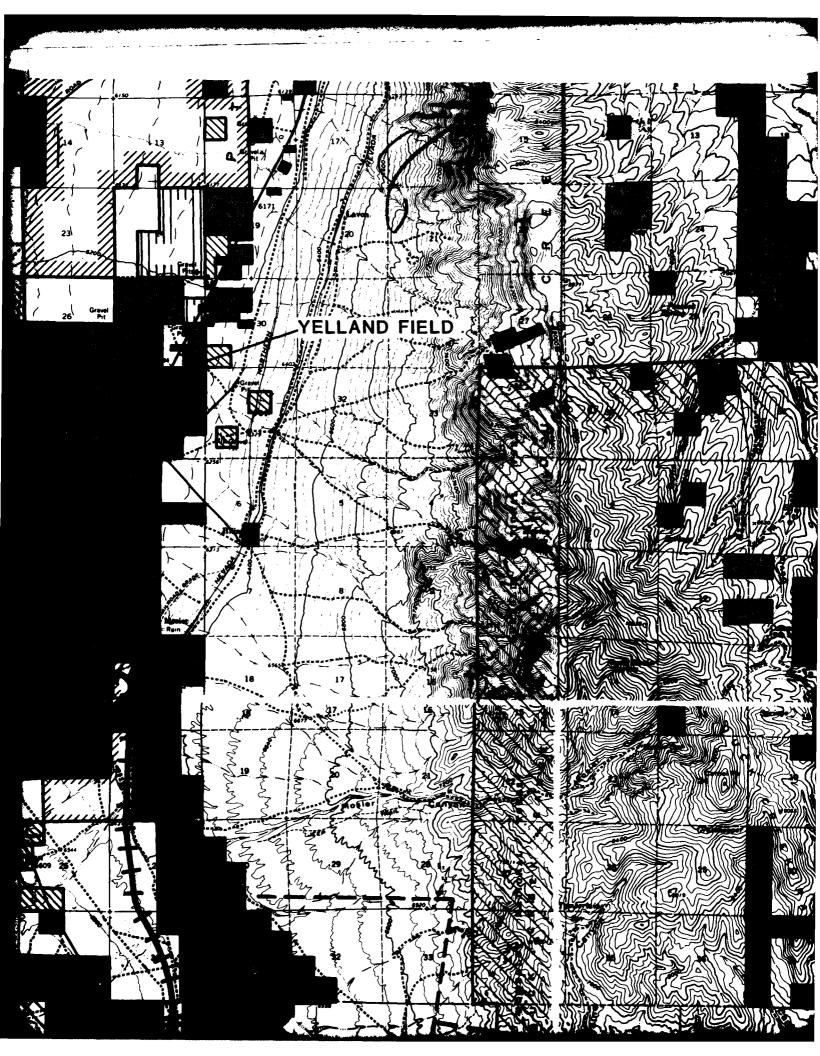


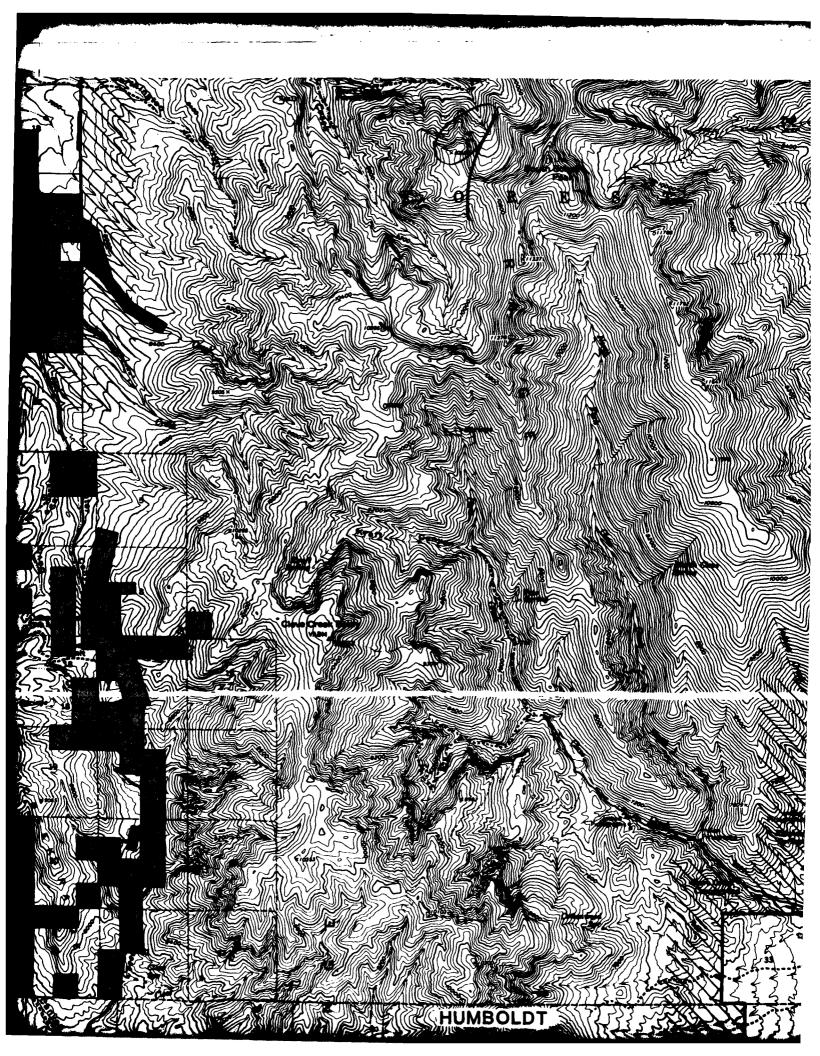


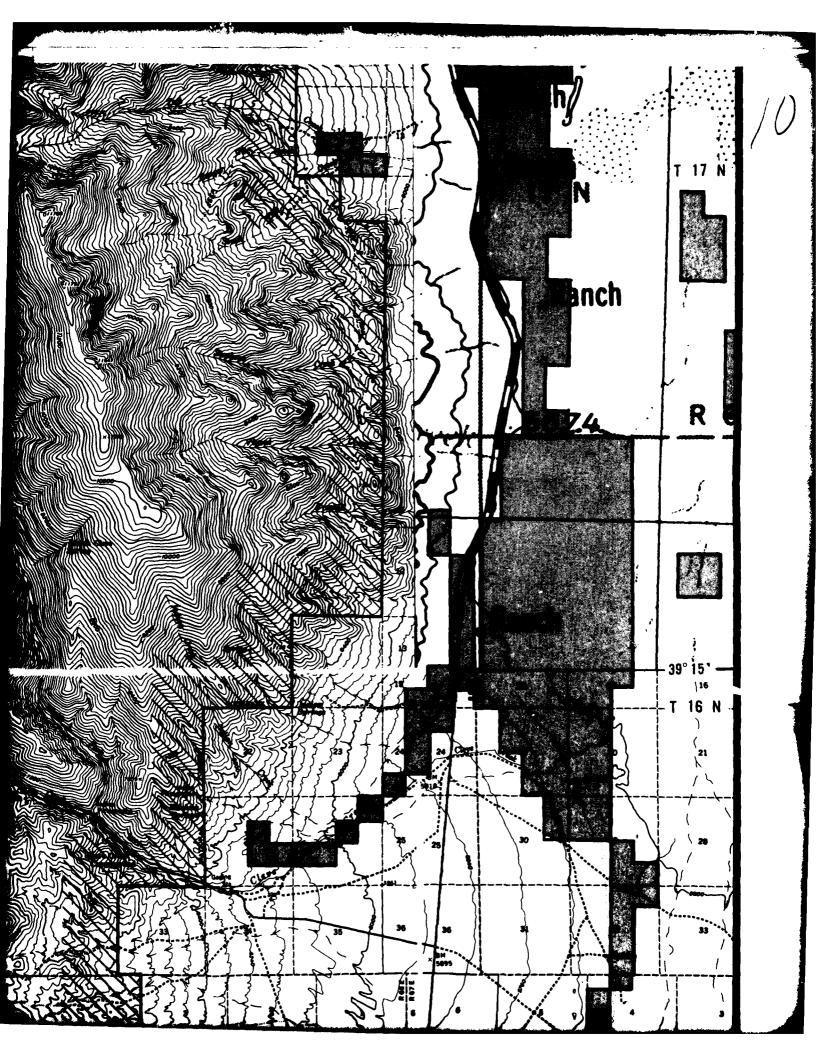


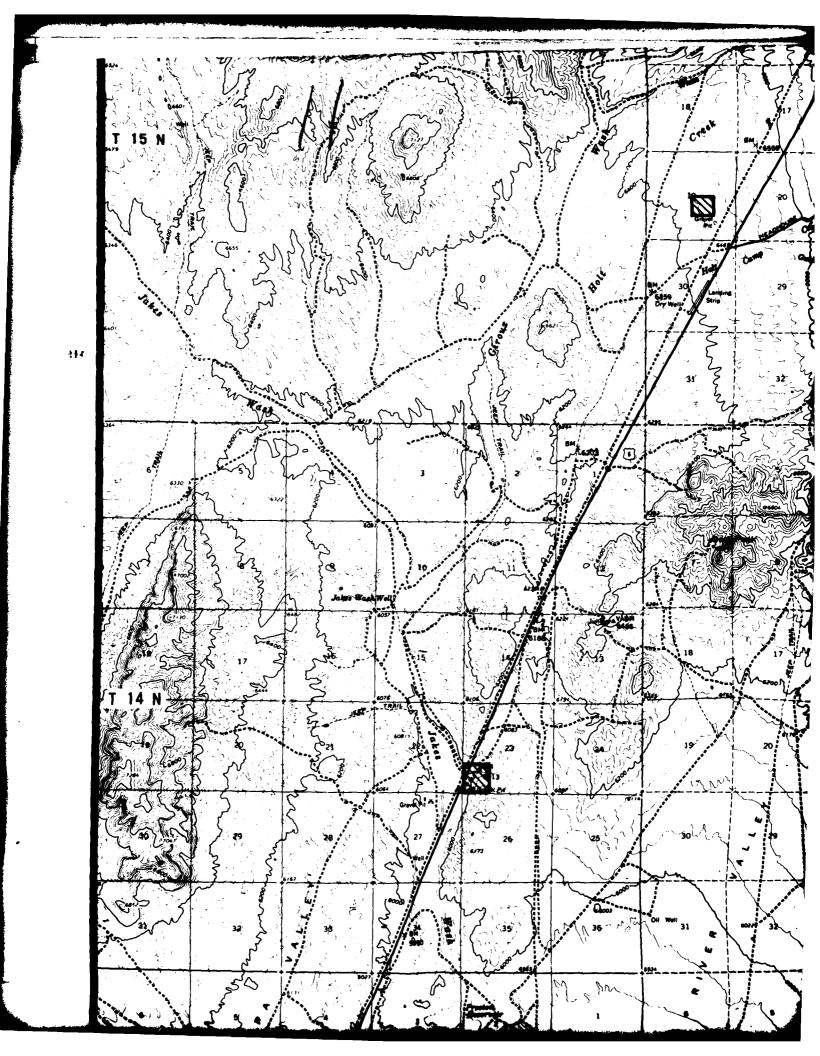


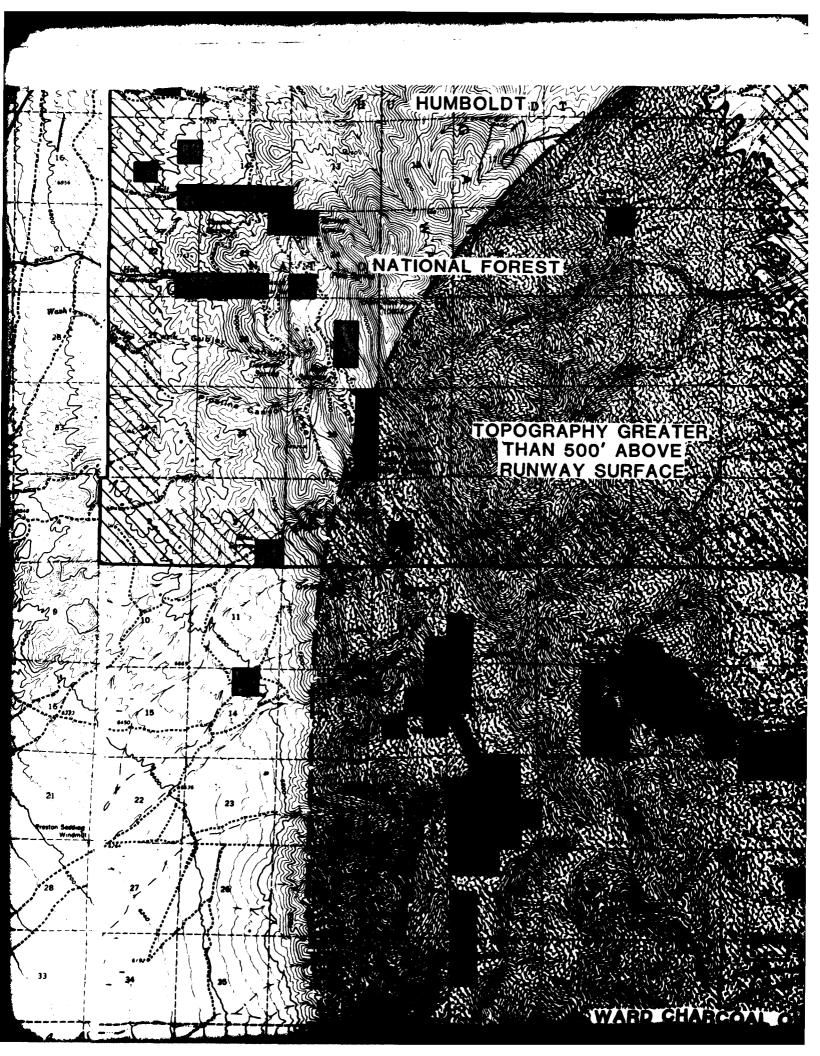


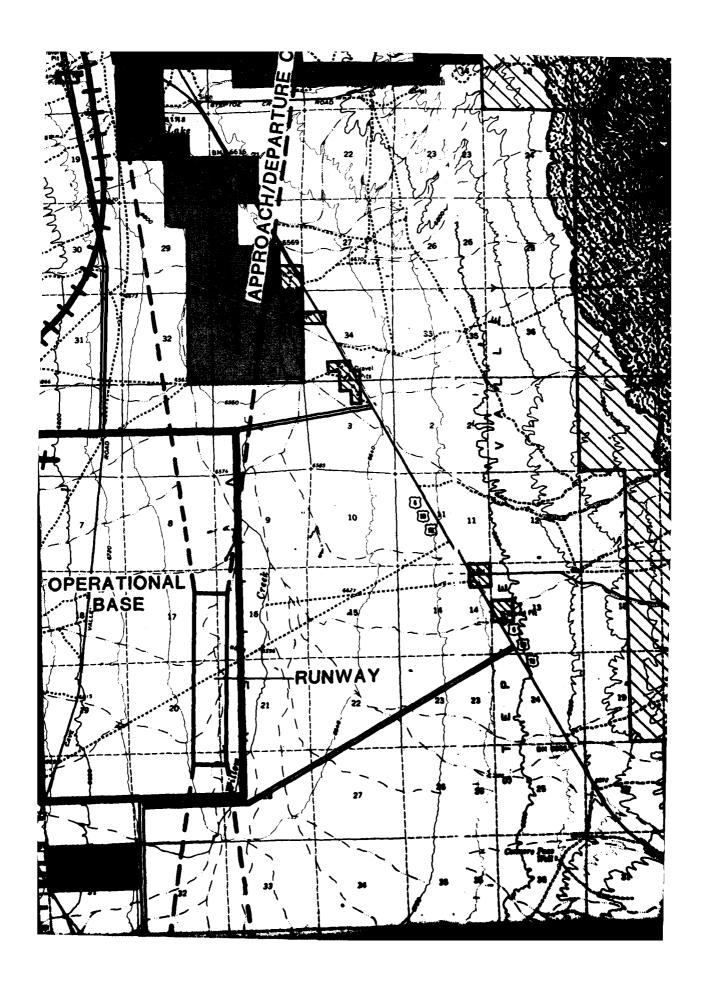


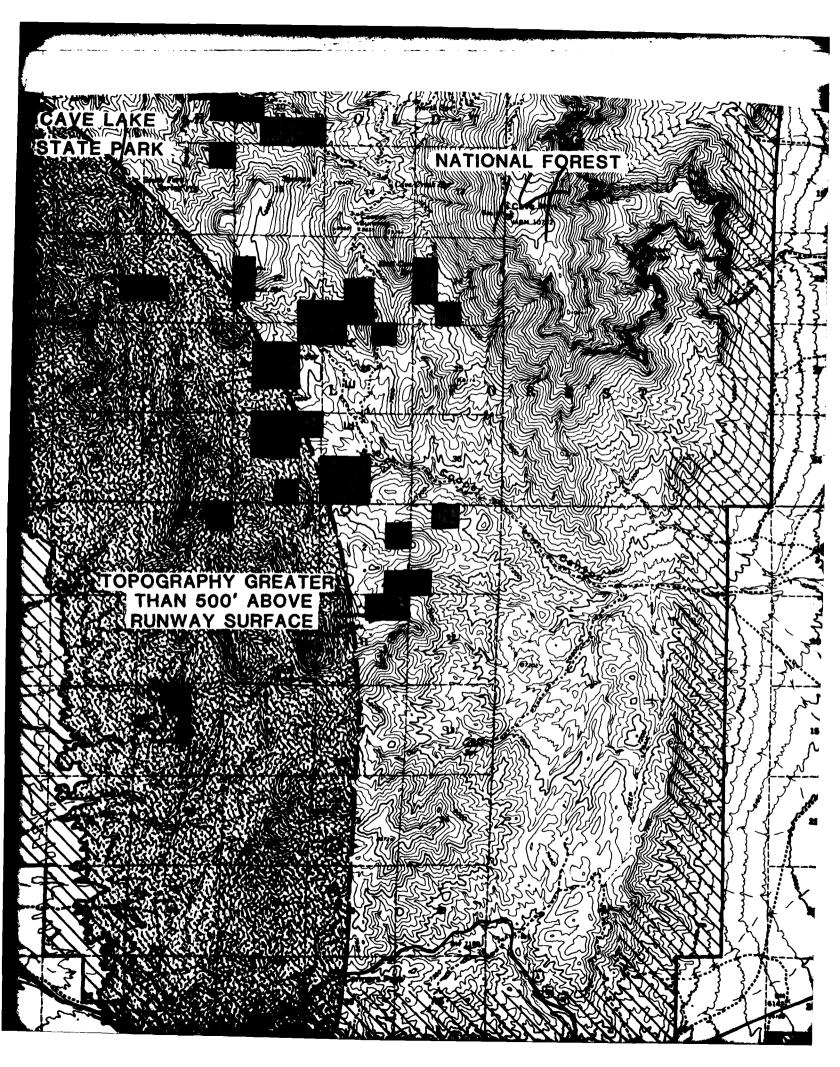


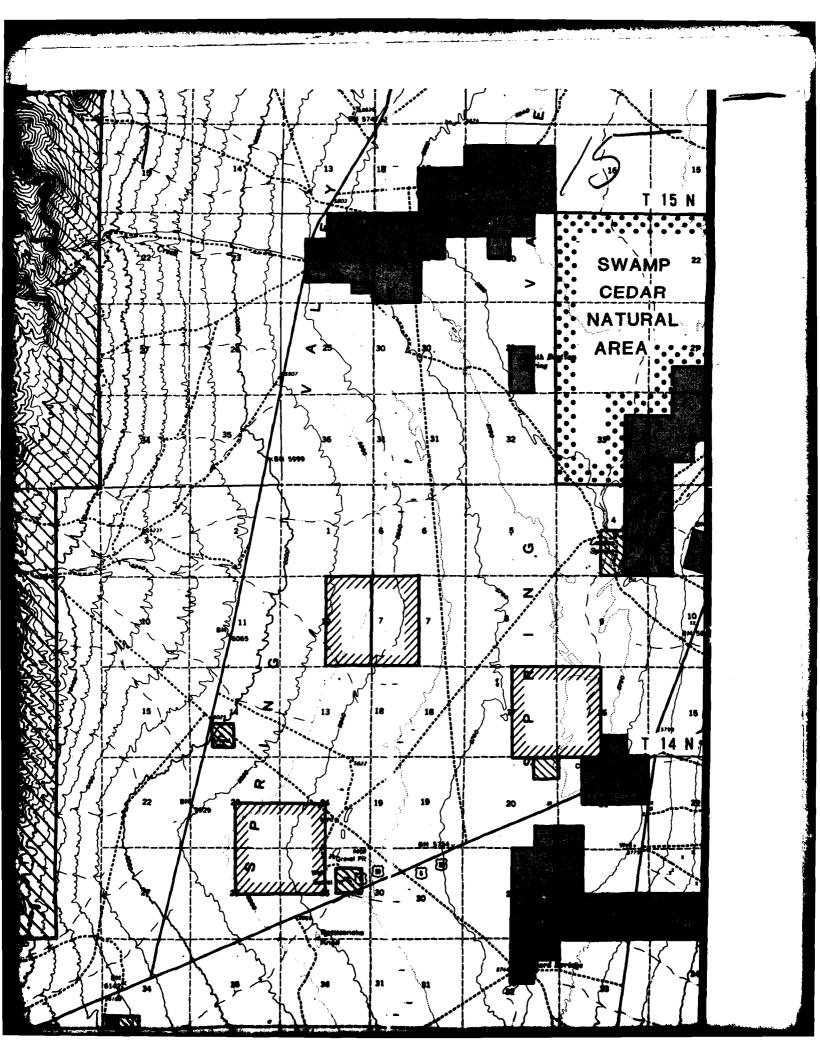


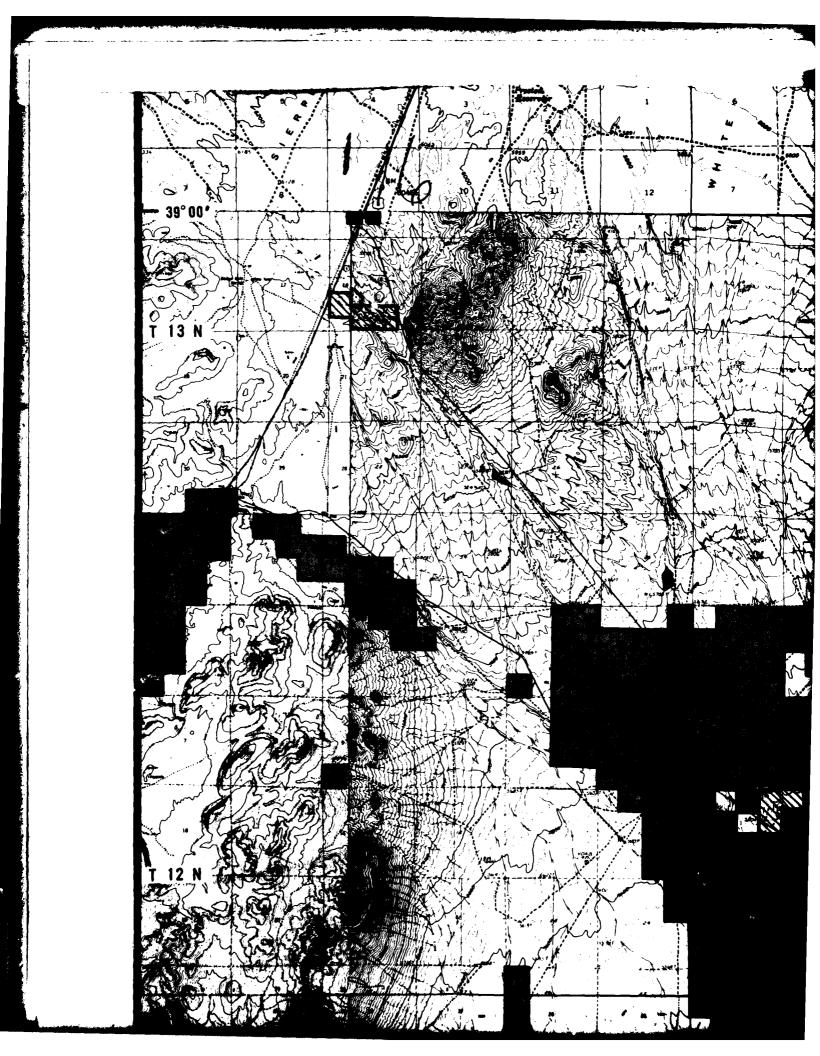


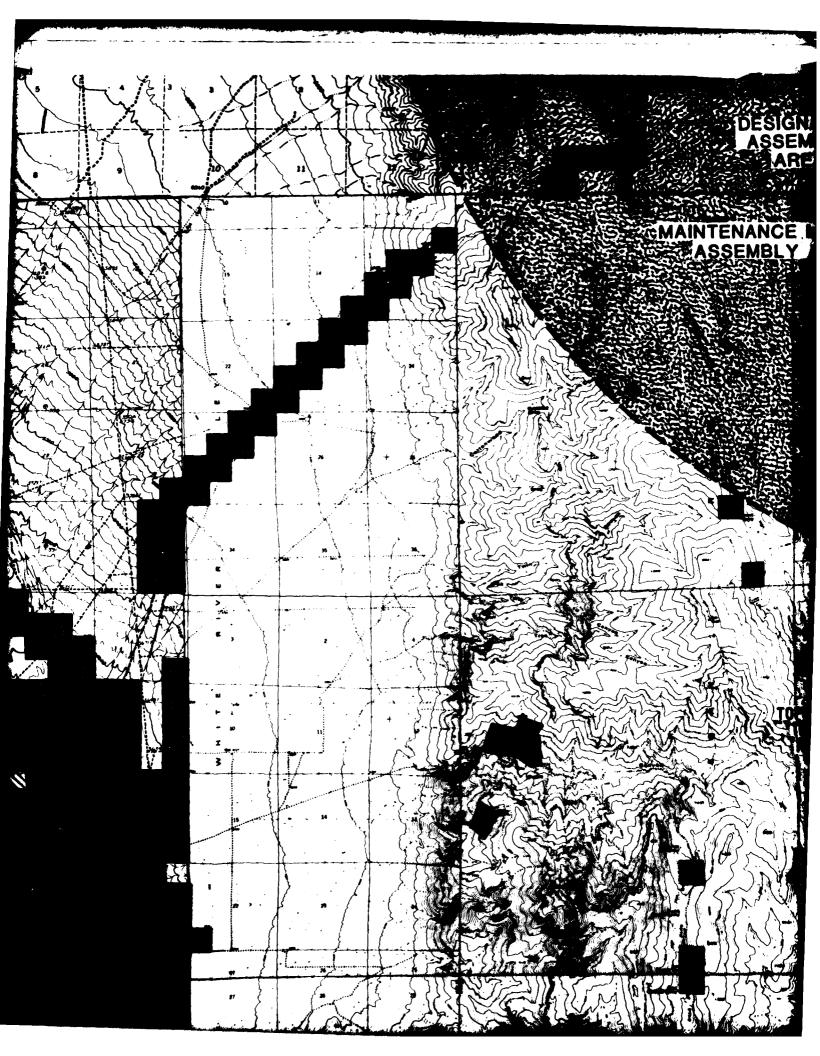


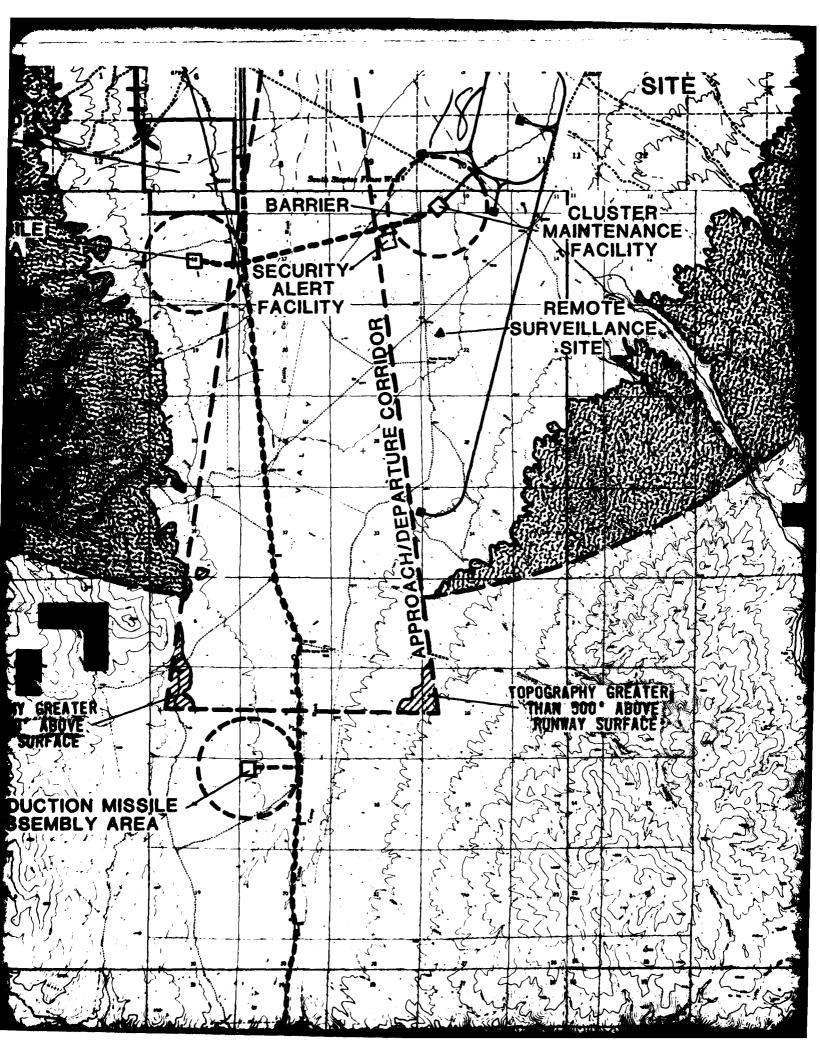


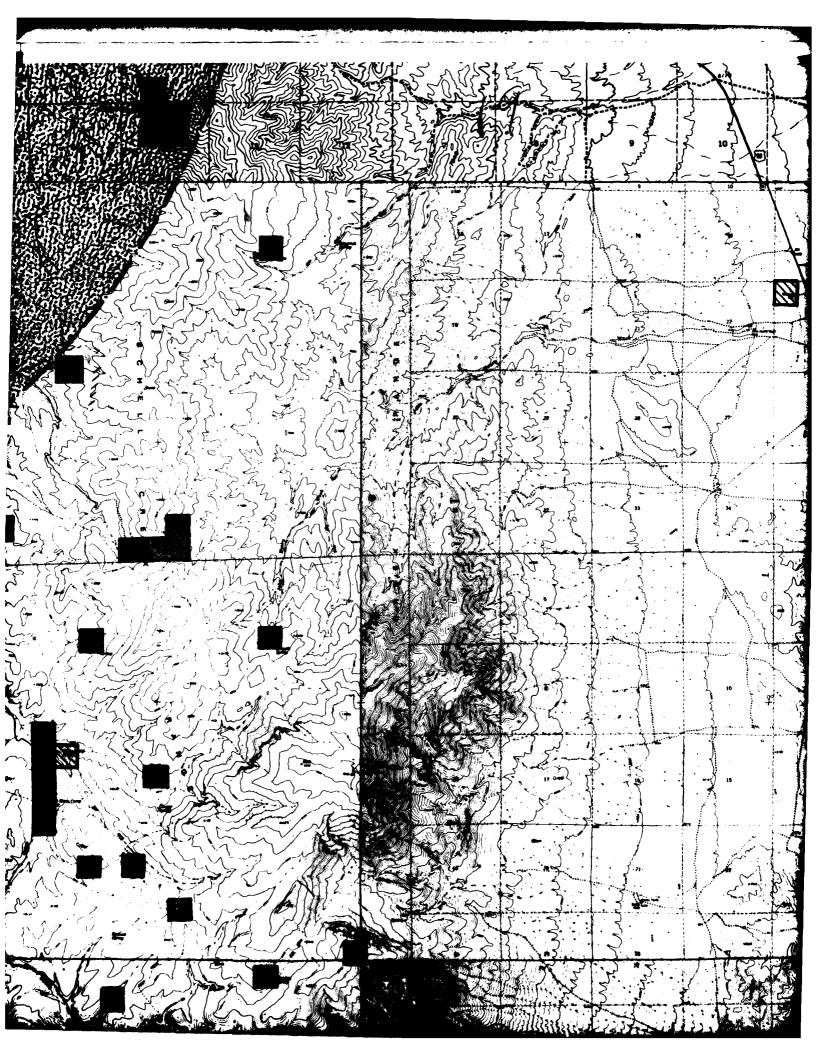


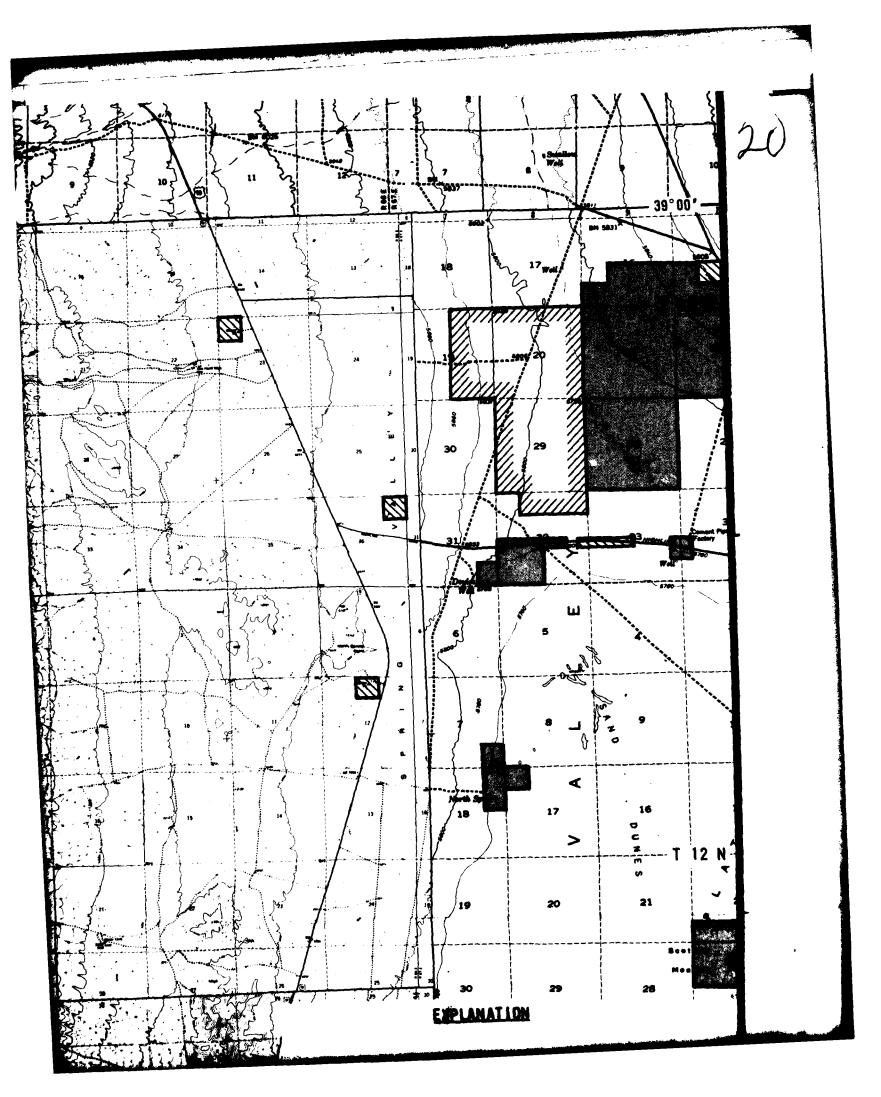






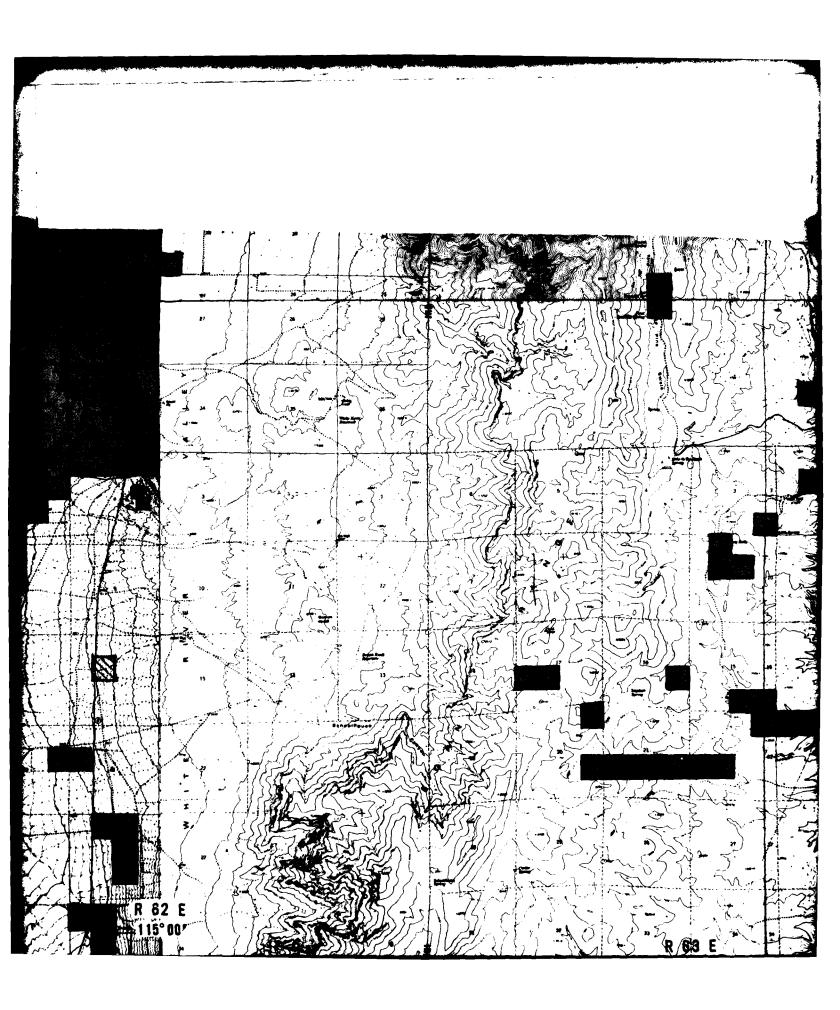


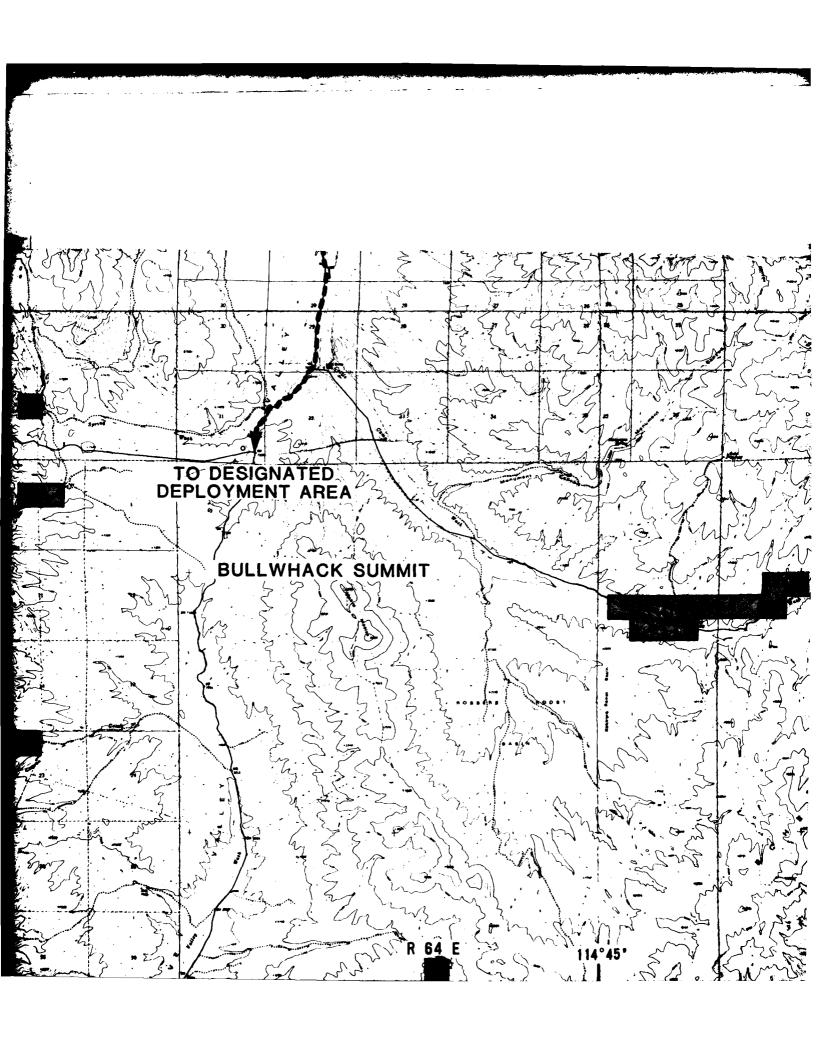


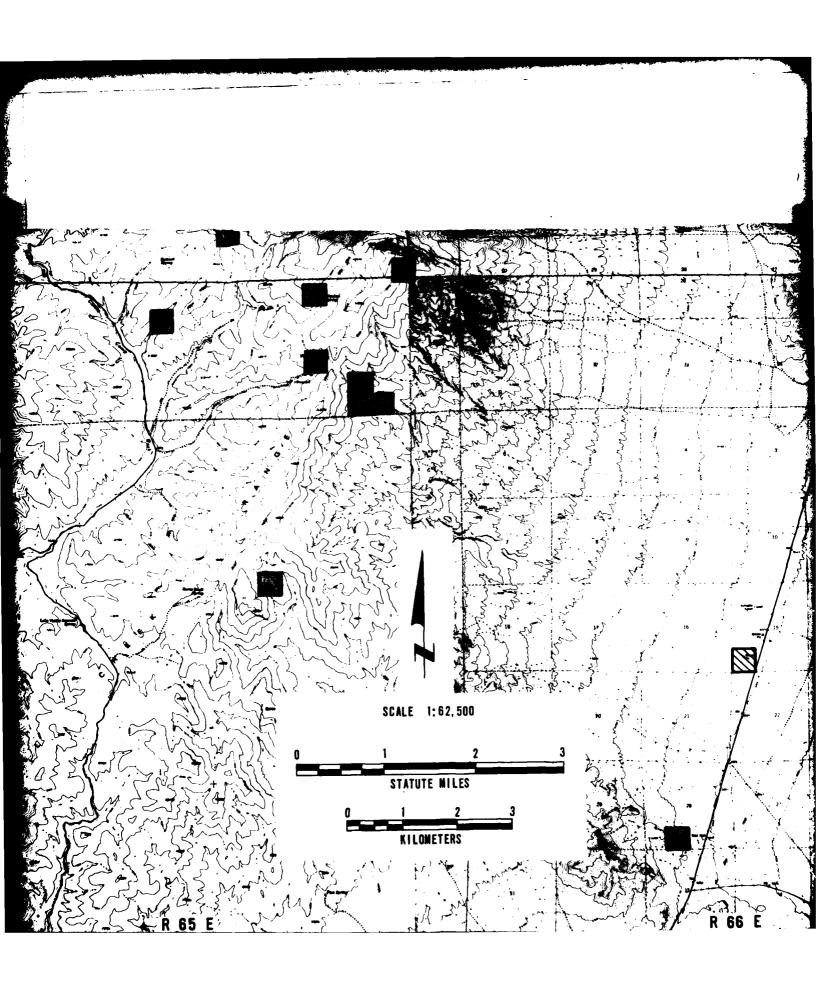


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21







EXPLANATION DESIGNATED TRANSPORTATION NETWORK (DTM) PROPOSED HIGHWAY PROPOSED RAILROAD BUREAU OF LAND MANAGEMENT DESIGNATED AREA (WITHIN BLM ONLY) DESERT-LAND ENTRY APPLICATION AIRPORT LEASE PRIVATE PROPERTY INCLUDING MINING PATENTS STATE PROPERTY INCLUDING MATERIAL SITES AND STATE PARKS HUMBOLDT NATIONAL FORESTS

> OPERATIONAL BASE LAYOUT OPTION 1 STEPTOE VALLEY, ELY AREA, NEVADA

MX SITING INVESTIGATION

DEPARTMENT OF THE AIR FORCE - BMO

DRAWING

7-1

UGRO NATIONAL, INC.

25